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NEW DIRECTIONS IN U.S. WATER POLICY

Summary, Conclusions
and Recommendations

from the Final Report of the
National Water Commission



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NEW DIRECTIONS IN U.S. WATER POLICY

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Summary, Conclusions and Recommendations

from the Final Report of the National Water Commission

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NATIONAL WATER COMMISSION

800 N. Quincy Street
Arlington, Virginia 22203

June 28, 1973

The President
The White House

The Honorable
The Speaker of the House
of Representatives

The Honorable
The President of
the Senate

Dear Mr. President:

Dear Mr. Speaker:

Dear Mr. President:

On June 14, 1973, the National Water Commission submitted its final report to you under the provisions of the National Water Commission Act of September 26, 1968. The report is a document of over 500 pages, and contains 232 recommendations, along with a number of conclusions covering almost all aspects of water resources problems that the Nation faces in the future.

This summary is prepared by the Commission for the use of those who will not have time to read the full report. It is in two parts. Part I epitomizes the full report and Part II consists of the conclusions and recommendations taken verbatim from the report.

The National Water Commission, you may recall, stemmed from proposals for water development in the Colorado River Basin which raised a number of fundamental questions as to what should be the future policies for water development in the United States. The Commission is completing its activities well in advance of the statutory deadline of September 26, 1973, after which the Commission will cease to exist.

Respectfully submitted,



Charles F. Luce, Chairman




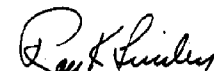
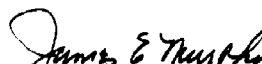


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Part 1

SUMMARY of the Commission's Report





SUMMARY REPORT

INTRODUCTION

The National Water Commission, created by Act of Congress in 1968 to review national water resources problems, submitted its report and recommendations to the President and the Congress on June 15, 1973. Because the full report is a document of nearly 600 pages, the Commission has prepared this summary for those who do not wish to take the time to read the complete report. For consideration of any of the specific recommendations of the Commission, the appropriate chapters in the full report should be consulted.

The Commission recognizes that Federal programs for navigation, reclamation, flood control, and hydroelectric power, among others, have made an enormous contribution to national well-being. But demands on the Nation's water supply have accelerated so rapidly during the past century that national policies governing water conservation, development, and utilization have inevitably lagged far behind national growth. New policies reflecting today's needs and the needs of the 21st century are essential to assure efficiency in water use and to sustain a healthful, esthetically pleasing environment.

Federal water programs evolved slowly over a long period of time as the people recognized problems and empowered the President and the Congress to give the Federal Government a major role in providing solutions. But new water policies rarely replaced old ones. They were usually added to existing programs, which contributed to the present need to modernize both national water policies and the governmental machinery that implements many of them.

The Federal program to make the inland waterways navigable began when the young Nation had almost no transportation system to move products from border regions to the cities, or to coastal harbors for export. Navigable waterways were essential if border regions were to be settled, become productive, and thus strengthen the Nation. At that time if waterways were



to be built the Federal treasury had to assume the cost. Subsequently the railroads were permitted a near monopoly over inland transportation, and Federal participation in waterway improvements was essential to protect the public interest. But today the historical policy basis for toll-free improved inland waterways has been eroded by the development of highly competitive alternative means of transport: heavy trucks traveling on a national highway system; a national system of pipelines carrying oil, gas, and coal; and a regulated national rail network. Now most of the regions served by inland waterways are highly developed. The direct beneficiaries, which include many of the Nation's largest corporations, can help pay for improvement of such waterways. The problem is no longer one of developing the only practicable means of transporting goods in the interior of the country, or of curbing monopoly power, but of developing the most efficient combination of transportation modes.

The Federal Reclamation Program came into being in an era when many individuals sought homes on the land, and national policy was strongly directed to encouraging the settlement of the Western States. Today the movement of people is away from the land to urban areas, and the United States has an agricultural plant capable of producing food and fiber greatly in excess of the Nation's present demands. In 1972 one American farm worker produced enough to feed 62 Americans, with surpluses for export. And the West has been settled, so much so that strong sentiment exists in some far-western States to discourage further immigration.

When the nationwide Federal flood control program was authorized it expressed the desire of the majority to help unfortunate fellow citizens located in flood-prone urban areas which had developed beyond the point at which relocation or flood-proof reconstruction was economically feasible. This humanitarian motivation was reinforced by the need for a program of

public works to get unemployed persons back to work during a great depression. Few could foresee that the national flood control program would be used to stimulate new construction and development in flood-prone areas. Few could foresee, either, that today the Federal Government would be building works to increase the value of agricultural lands in river bottoms, and providing protection for the narrow flood plains of small creeks—problems that can easily be dealt with by local entities or by States. Today the major problem of reducing damages to existing development is overshadowed by the need for keeping additional exposure to flood damages from developing. The Nation has had little success in this, as is shown by the fact that annual flood damages are increasing in spite of billions of dollars spent for protective works.

The first Federal hydroelectric projects, which set the pattern for others to follow, were built primarily to assist navigation, to supply irrigation water, to reduce floods, or for a combination of these purposes. Generation of electricity was an ancillary and subordinate purpose. Powerful political support for Federal hydroelectric projects was engendered by the desire for rural electrification, the need to provide employment in depression years, and the fact that revenues from the sale of power made dams built primarily for navigation, reclamation, or flood control economically more attractive. Today the demand for an expanding Federal hydroelectric program has greatly diminished, especially with respect to construction of new dams as distinguished from the addition of generating units at existing dams. Primarily this is because most good dam sites already have been developed. But it is also because the conditions changed which underlay the great Federal navigation, reclamation, and flood control programs, thus the need for the powerhouses typically associated with those programs correspondingly changed.

Today's major water problems were unknown when the Nation decided to assume responsibility for navigation improvements, reclamation, and flood control. Today the United States is more fully settled and predominantly urban. The people of the United States give far greater weight to environmental and esthetic values than they did when the Nation was young and less settled. They are attacking the enormous problem of controlling the pollution which befouls their rivers, lakes, and estuaries. Increasingly they are concerned with preserving the recreational values of natural water resources and developing the recreational potential of existing water projects. In short, today's conditions differ greatly from those that existed when the Nation's major water programs were created to meet the needs of an earlier era. This Commission concluded early in its life that it had no more important task than that of reappraising existing policies and programs in the light of changed conditions and demands, and of seeking guidelines for bringing the water policies and programs of the United States into harmony with the goals of a highly developed, affluent, and urban industrial nation.

It is not the Commission's function to recommend what the Nation's social

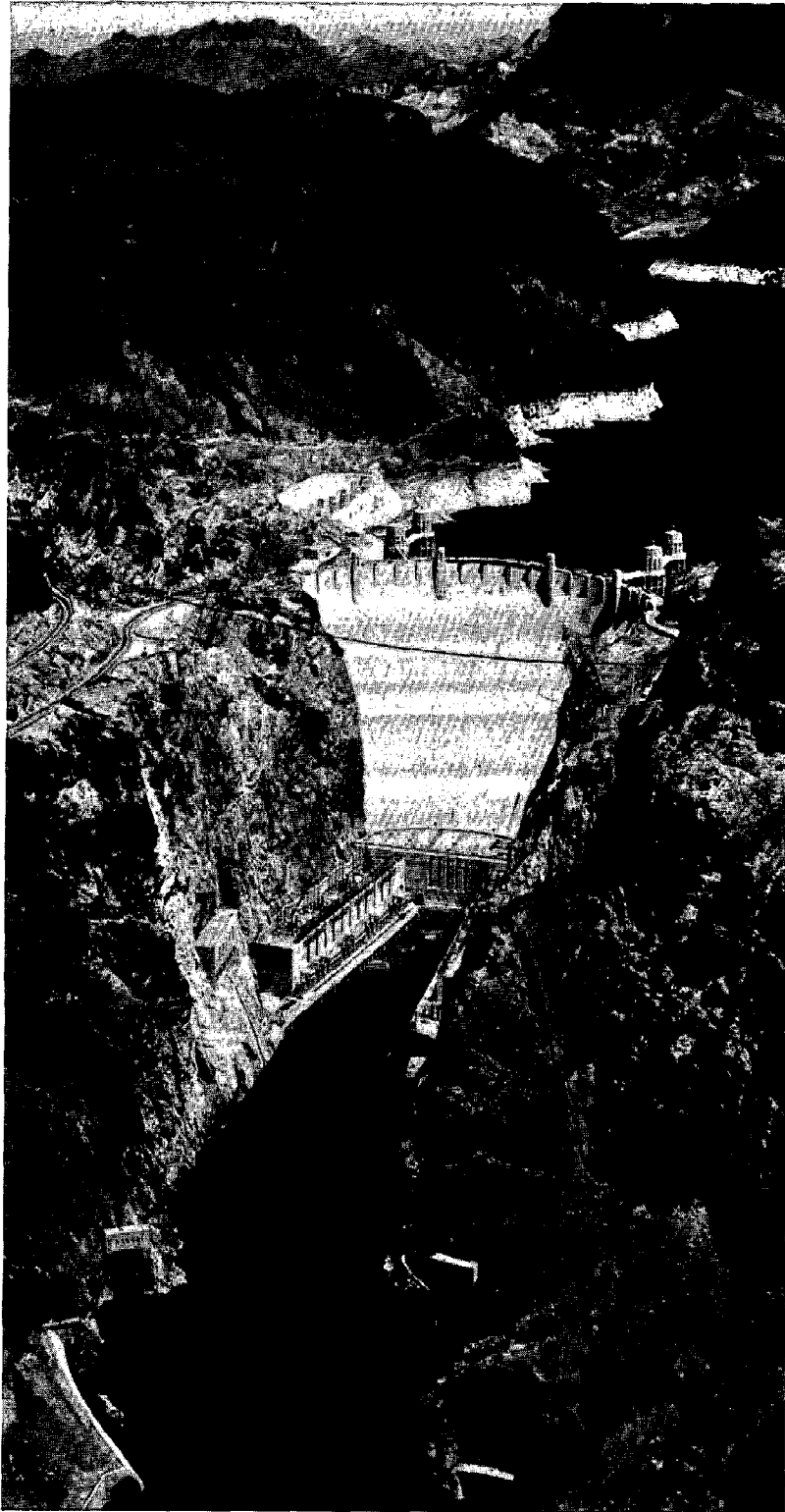
goals and objectives—and their relative priorities—should be. That is the job of the President, the Congress, and State and local governments, working under a representative form of government. Programs to protect and to use water require large expenditures. Water programs, however, are not the only social demands competing for limited capital resources. Housing, education, health care, aid to the indigent, transportation, energy, air pollution control, national security, law enforcement, and other social demands all seek a larger share of the Nation's funds. To determine where water programs should fit into an overall priority list is beyond the scope of the Commission's assignment.

Seven Recurring Themes

During the next 30 years the Nation will debate and decide a number of issues of water policy. The report of the National Water Commission seeks to contribute to the debates and decisions by identifying the issues likely to arise, analyzing them, and stating conclusions and recommendations with supporting reasons. The issues dealt with are numerous, ranging over policies and programs at all levels of government. The detailed recommendations consequently run into the hundreds. Despite the detail, a relatively small number of themes emerge in the report.

First, the report emphasizes that the level of future demands for water is not inevitable but derives in large part from policy decisions within the control of society. Future demands for water cannot be forecast accurately by the simple extension of past trends. The distinguished scientist René Dubos put it simply but eloquently: "Trend is not destiny." The National Water Commission says the same thing when it asserts that society can choose "alternative futures." Good planning, the Commission believes, should be based upon a range of realistic alternative futures and should set forth alternative courses of action to promote flexible responses. Forecasts of water supply and water demand should consider realistic maximum, minimum, and mid-range figures for population, technological development, economic growth, environmental standards, consumer preferences, and governmental policies. By considering the range of alternative futures, the Nation can minimize both the risk of not being able to solve problems created by unanticipated demands and the risk of premature commitment of large resources to the solution of problems that do not arise.

A second recurring theme of the Commission's report is that it sees a shift in national priorities from development of water resources to restoration and enhancement of water quality. It is likely in the future that there will be increasing demand for noncommercial uses of water for recreation, esthetics, and preservation of the balance of nature. At the same time, however, there may be an increased demand for water-related services sold in the marketplace, such as electric power. These demands are not altogether incompatible: Good planning and imaginative design often can allow for



Large dam construction has been a primary focus of Federal water planners in the past, and most of the best dam sites have now been developed.

economic growth while preserving or even enhancing environmental quality, particularly where there is a strong commitment to research in environmental technologies. But conflict will be inescapable at times and should be resolved by an appropriate balancing process. An effective balancing process requires identification of the interests at stake, availability of information about consequences of alternative courses of action, procedures for hearing and considering divergent points of view, and appropriate decisionmaking bodies to evaluate benefits and costs, risks, and potential gains. To be avoided are piecemeal decisions and tactical delays which produce nondecisions.

Third, the Commission believes that water resource planning must be tied more closely to land use planning. In the past the construction of large structures has occupied most of the attention of Federal water planners. But most of the best sites for large water projects have already been developed. As the Nation strives to improve the quality of its waters, Federal water agencies should deemphasize their construction operations and replace them with planning and management functions in coordination with broad-based resource planning at the State and local levels. If the programs of the Federal agencies are to relate to the new national priorities that emphasize quality of the environment, they must be closely coordinated with land use planning.

Fourth, the Commission recommends policies which will lead to the conservation of water—policies which will motivate better use of water and reduce water losses by improved efficiency. To conserve water it is necessary to increase efficiency and reduce waste in a wide range of economic activity, for example in the production and consumption of energy, foodstuffs, and many consumer goods. The waste of steel and gasoline in unnecessarily large automobiles indirectly wastes water used in steel and gasoline manufacturing processes. The waste of electricity indirectly wastes the water needed to cool thermal generating plants.

Fifth, the Commission believes that sound economic principles should be applied to decisions on whether to build water projects. A goal of water resource development should be a net increase in the goods and services available to consumers with due regard for protection of environmental values. Benefits, properly discounted to reflect the fact that they are usually realized over many years, should exceed costs, the major portion of which usually is incurred in the early stages of project construction. While benefit-cost analysis should be of major importance in determining whether a water project should be built, the Commission believes that demand for the services to be provided by the project should ordinarily be determined by the traditional means of measuring the consumer's willingness to pay its full costs. Thus there would be a double assurance of the economic justification for a water project. The policy need not be implemented overnight, but the Nation should move steadily toward that objective.

If the Nation is to achieve wise and efficient use of its water resources, the identifiable beneficiaries of water services should be obliged to pay the cost

of providing the benefits they receive. User charges designed to recover all or a major portion of the costs of water-based services are the primary mechanism which the Commission believes would reduce distortion in the allocation of economic resources, and encourage least-cost achievement of environmental goals. User charges would discourage construction of projects that unnecessarily change the environment and encourage conservation practices that protect the environment. They appear to offer the best assurance that insofar as water programs are concerned, the United States would get its money's worth, and that natural economic advantages and consumer choices would be allowed to establish the production patterns of the Nation's farms, factories, and waterways.

By advocating user charges the Commission does not imply opposition to Federal, State, or municipal investment in water resource developments. To the contrary, insofar as appropriations of Federal tax dollars for water programs are concerned, the Commission recommends that they be greatly increased, but redirected from projects that control or use water to projects for the improvement of water quality. Where interstate or international waters are involved, where multipurpose river basin developments are involved, or where there is unwillingness or inability of non-Federal interests to fulfill a national goal, the Federal Government should participate vigorously in water resource developments, whether to improve water quality or to increase water supply. At the State and local government level, where public interest or preference calls for it, governmental participation will have to be substantial. What the Commission recommends against is not public investment but unjustified public subsidy which reduces efficiency, distorts the allocation of scarce resources, damages the environment with unnecessary projects, or promotes the wasteful use of water. Who should finance, construct, and operate various water resource developments is one question. Who should pay for them is another. The Commission believes that even where a public agency is the proper entity to finance, build, and operate a water project, directly identifiable beneficiaries should ordinarily be obliged to pay their full share of the costs of the facilities from which they benefit.

Although the Commission believes that proposed water projects should be subjected to rigorous economic analysis, and that when all benefits and costs are counted the most economic alternative often will be the most environmentally desirable, it recognizes that not all water decisions should or will be made solely upon economic grounds. The ultimate test must be the public interest. A conspicuous example of this truth is the staggeringly expensive national commitment to clean water which the Commission endorses but more for social than for demonstrable economic reasons. It is essential, however, that objective economic analyses precede decisions affecting water resources even though the final decision may be made upon other grounds. In this way the decisionmaker will know the true economic costs and benefits of the decision that is made. Too many times in the past water decisions have been made upon spurious economic grounds whereas if

the decisions had been preceded by genuine economic analysis, counting all the costs and not exaggerating the benefits, they might have been made differently.

Sixth, the Commission believes that laws and legal institutions should be reexamined in the light of contemporary water problems. Many water laws, both statutory and judge-made, have their origin in the 19th century and were fashioned to meet social needs of that era. Many of these laws do not work well in solving problems of today and the emerging problems of tomorrow. In the West the law often prevents or discourages the transfer of water rights to more valuable economic uses. Typically, also, it affords insufficient protection to noncommercial water values, especially instream values. In the East the law fails to provide a satisfactory foundation for resource planning and development.

In particular, there is need to modernize laws dealing with ground water. Up until very recently insufficient attention has been given regulation of ground water as part of the total water resource, and as something which should be closely coordinated with regulation of surface waters. Not only is ground water a major source of water supply for agriculture, industry, and municipalities, it is susceptible to pollution which can be even more serious than pollution of surface waters. These factors must be considered in modernizing water laws.

Seventh, the Commission believes that development, management, and protection of water resources should be controlled by that level of government nearest the problem and most capable of effectively representing the vital interests involved. Although the Commission recommends a large Federal role in the planning and financing of water programs, it believes that this role should gradually diminish. Regional and State entities, as well as local units of government, should assume increasing roles in the control of water resources use and preservation. There will be a continuing need for vigilant Federal oversight, however. The Federal Government should encourage regional, State, and local programs, and assume responsibility when other levels of government fail to perform.

In the remainder of this summary—and in the main report—these seven themes recur again and again.

Water Requirements versus Demand for Water

A persistent tendency of water resources planning in the Nation's Capital and elsewhere has been the reliance upon single projections of water use into the future as a basis for forecasting water requirements. Such linear projections assume a continuation of present policies, and may lead to astronomical estimates of future water requirements.

The amount of water actually used in the future is not, however, pre-ordained. It will depend in large measure upon the public policies



Water "requirements" of society are not always the same as water "demands." Water in its natural state also provides substantial values to society.

adopted. Water "requirements" of society are not the same as water "demands," and are indeed much less than the "demands," which are affected by a host of factors and policy decisions, often in fields far removed from what is generally considered to be water policy. For example, the invention of the kitchen disposal unit greatly increased the load on municipal sewage treatment plants, and the decision to support the price of cotton led to vast increases in irrigated acreage on the High Plains of Texas.

Alternative Futures

It is therefore unrealistic, and in fact unwise, to attempt to forecast precise levels of future water use on the basis of past water use. How much water will be used, where, and for what purposes will depend in large part upon policies and priorities that society has the power to determine. A range of "alternative futures" is possible, depending upon population levels and distribution, per capita energy consumption, rate of national income growth, technological development, water pricing policies, consumer habits and lifestyles, environmental and other governmental policies, and other variables.

But how can we forecast the governmental policies that affect water demand: the Nation's farm policy, its export policy, its economic growth policy? What will be the people's lifestyles: the birth rate, the population distribution, the dietary habits of the next generation? Political preferences expressed with ballots and consumer preferences expressed with dollars will combine to determine the policies that influence the demand for water to provide the services dependent on water. No one can accurately predict how these variables will combine to influence the demand for water by the year 2000, but assumptions can be made and statistics provided to illustrate realistic future alternatives.

Although all eventualities should be considered in planning, development, and management of water resources, the Commission believes it unrealistic to develop water policy on the basis of a "crisis scenario" such as a severe worldwide drought extending over many years. Rather than develop national water policy on speculation of famine, it would be preferable to provide an assurance of ample foodstuffs by more direct measures, such as a national or even a world food bank. Thus the Commission did not include a large number of alternative futures in its background studies, but selected for illustrative purposes only a reasonable number of possible combinations.

Water Supplies and Demands

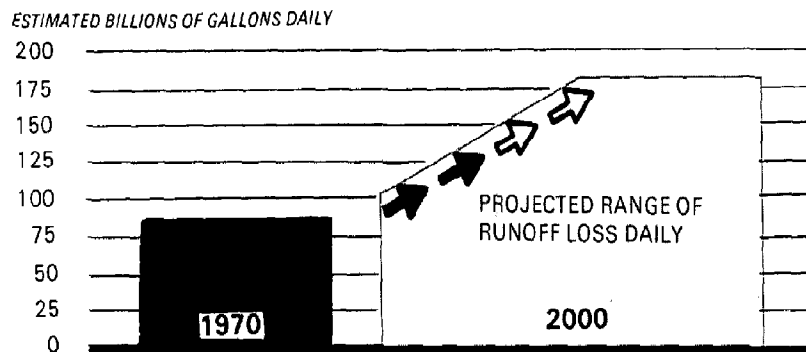
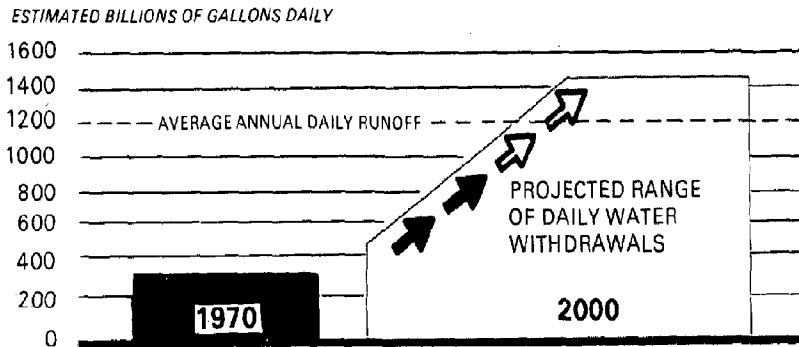
Water is a renewable natural resource in abundant supply in some parts of

the country and in short supply in others. The adequacy of the supply depends on demand as well as on physical quantities, and demand may be expressed in both market and nonmarket terms. The willingness of the farmer, the manufacturer, or the householder to pay for water supply expresses the market demand. Nonmarket demands for clean water, for free-flowing streams, and for recreational opportunities are most often expressed through political action.

Studies made for the Commission indicate that withdrawals of water in the year 2000 may range from one and one-quarter to almost four times the estimated withdrawals of 370 billion gallons per day (b.g.d.) in 1970. If the upper limit were to be realized, withdrawals in the year 2000 could exceed 1,200 b.g.d., the average annual surface runoff in the Nation. This upper limit projection is less significant than might appear because a large percentage of withdrawals are returned to the stream and are available for reuse. The significant measure of water demand lies more in the amounts consumed by evaporation and transpiration, estimated by the U.S. Geological Survey to be 89 b.g.d. in 1970. The Commission studies suggest that total consumptive use in the year 2000 may range from one and one-quarter to about twice the consumptive use in 1970. Irrigated agriculture accounts for the largest consumptive use of water, more than 80 percent of the 1970 total. The dominant influence of agriculture on consumptive water use led the Commission to employ experts to make projections of possible agricultural water and land demand in the year 2000. Consistent with the Commission's philosophy, the studies projected a number of alternative farm futures, depending on combinations of such variables as future population, food and fiber exports, technology, water prices, farmland retirement programs, fertilizer restrictions, and substitution of vegetable protein for part of the projected per capita increase in consumption of animal protein. On the basis of these studies the Commission believes it reasonable to assume for planning purposes that the Nation's presently developed resource base of cropland and water will be sufficient to meet food and fiber demands through the year 2000.

Of the numerous alternatives studied, the one that showed the most substantial future increases in demand for food and fiber was based on a U.S. population of 325 million in the year 2000 (25 million above the highest estimate for that year which the Census Bureau now projects and 74 million greater than the Bureau's lowest year 2000 projection), a doubling of the 1967-69 level of agricultural exports in the year 2000, an increase in per capita consumption of beef and veal from 118 pounds per year to 158 pounds, and a price of water to irrigation farmers that is unchanged from today's prices. Even under these assumptions, demands could be met and still leave 16 million acres of presently developed farmland unused. And there would be a substantial amount of water available for other purposes.

A recent official U.S. Department of Agriculture report confirms this.



Based on projections of population, per capita food consumption, and land use for the year 2000, the department's Economic Research Service (ERS) forecasts a 34 million-acre reduction in farmland below current levels, including 1-1/2 million fewer acres in cropland. This ERS report assumes a U.S. population of 308 million for the year 2000 which exceeds the highest current Census Bureau projection for that year by 8 million.

Any forecast can, of course, err. Neither this nor any other Commission has the gift of prophecy. The Commission does not know whether any of the alternative futures it has considered will materialize. It is possible that even the alternative future which projects the greatest increase in demand for food and fiber may be too low. But the Commission believes the assumptions which underlie its alternative futures are not unreasonable. And it believes the policies it recommends will lead to the most efficient use of the Nation's land and water resources to satisfy whatever demand for food and fiber materializes. In the Commission's view it would be highly imprudent to conclude, as a matter of national policy, that the bringing into production of new farm lands should continue to be subsidized on the basis of speculations of food shortages that might arise because farm technology may falter; or because blights and droughts of catastrophic proportion may occur; or because other nations such as the Soviet Union and China may become dependent upon the United States for food supply.

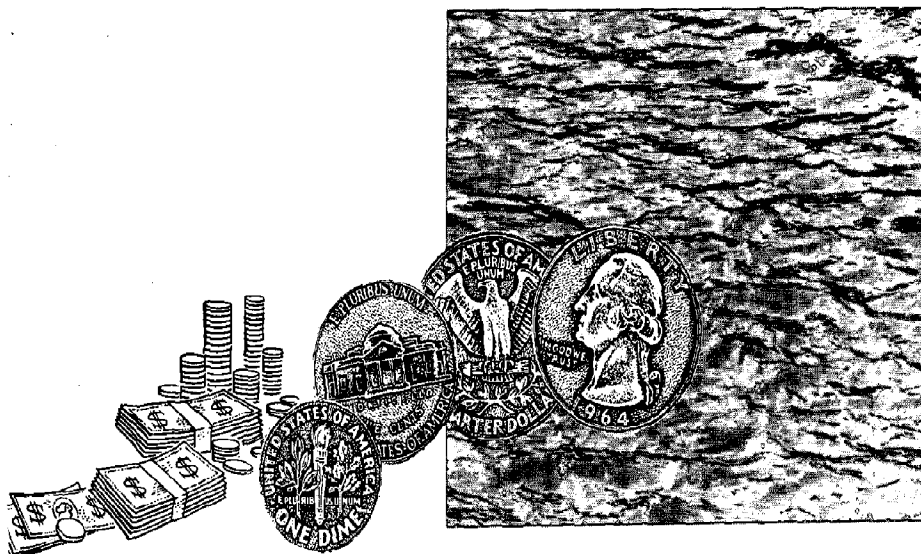
ECONOMICS

The general economic principles expounded in the Commission's report can be broadly stated: (1) Public investment in water resource development should contribute to economic well-being; and (2) where direct beneficiaries of public water resource development can be identified, they should pay the full costs of the development. The two principles are interrelated. The objective of the economic well-being criterion is the efficient allocation of resources which, when achieved, increases the net value of goods and services available to consumers. One means of accomplishing efficient resource allocation is by pricing goods and services in accordance with their actual costs.

Pricing

Where resources are limited, society cannot have all of everything it would like. It behooves society to apportion the use of scarce resources to obtain the maximum beneficial return. Where scarce resources are diverted excessively into the production of certain things, it is done at the sacrifice of producing other things. Having too much of one thing means not having enough of another. To maximize returns to society, an optimum balance must be struck. The pricing mechanism is a powerful and effective way to do this.

Goods and services in great demand command high prices and return large profits. The resources used in their production receive high returns and are bid away from alternate uses. On the other hand, products for which demand is poor or supply excessive receive low prices. Their producers suffer losses instead of profits. The resources associated with their production receive low returns and get bid away from the production of relatively unwanted goods and services into the production of goods and services in greater demand. In this way benefits to society are maximized. This is what is meant by economic efficiency.



The Commission believes that much of the Nation's water supply, being a limited resource, should be responsive to this kind of pricing mechanism so that it will not be inefficiently utilized for the production of things in overabundance but will be diverted instead into the production of things society desires more. The same is true for water resource developments such as structures for flood control, irrigation, navigation, and hydroelectric power. By charging prices for water and water-related services that fairly reflect their cost, water resources will be put to the productive uses that most benefit society. While other means might be employed to motivate better use of existing and future supplies of water, such as elaborate rationing mechanisms, nothing is more comprehensive and effective than the pricing mechanism.

An important qualification must be made. As valuable as pricing water and imposing user charges can be toward motivating better use of the Nation's water resources, it cannot be relied upon exclusively to achieve the highest and best use from an overall social standpoint. To be effective, conventional markets and the pricing mechanism must operate in an arena of well-defined rules. For example, pricing of water and imposition of user charges should not be allowed to lead to improper land use or to water quality degradation. Land use planning and water quality standards should set constraints on the use of both land and related water so that when water pricing and user charges are implemented, the results assure constructive social benefits.

It was not always so, but virtually all water in the United States today is in some use—for esthetic or for commercial purposes, for fish and wildlife as well as for navigation, for recreation as well as for hydroelectric power production, for countless purposes each of which enhances the material or spiritual well-being of the American people. Therefore it is no longer justified, as once it may have been, to make water available at less than its full cost. Moreover, as competing demands for water and water-related services

increase, water becomes progressively more valuable—too valuable to be given away or priced below cost.

Pricing to achieve more efficient allocation of water resources has not been fully utilized by water suppliers. Some cities do not meter water deliveries and others that do meter do not base water charges on the cost of service to users. The Commission recommends that public suppliers of water install meters to measure deliveries and charge prices that reflect the cost of service to each class of user. For example, users farther from the source of supply and at an elevation requiring pumping should pay the extra costs they impose on the system. Similarly, users who require extra capacity in the system for peaking purposes should pay the incremental costs of providing increased capacity. Where Federal agencies such as the Corps of Engineers, the Bureau of Reclamation, or the Soil Conservation Service develop water supplies or make loans to enable others to do so, Federal law should require the collection of water charges based on the cost of service.

Cost of service is not necessarily the only cost a user of water imposes on society. Water used for one purpose may foreclose the use of that water for some other purpose. For example, agricultural consumption of water upstream from a powerplant reduces the hydroelectric power benefits available to society from the stream. If this competition could be resolved by market forces, the more valuable use would buy out the less valuable, and the cost to the consumer of the more valuable product would reflect the foregone alternative use. But present laws and institutions frequently do not permit the market to operate, and the loss of benefits from alternative uses often is not reflected in water charges.

Improving the system is not easy. The value of foregone alternative uses is hard to determine. Studies prepared for the Commission indicate, however, that research on the value of water in alternative uses holds promise of producing reliable data to guide planning and decisionmaking. Another obstacle to water pricing, and to its evaluation in alternative uses, is the fact that nearly 80 percent of water withdrawals is self-supplied. Hence, no agency is in a position to collect charges for the use of this water. Water differs from other resources in that to a large extent its allocation among different uses is made outside a market price system. Legal and administrative institutions, based more often than not on tradition rather than economic efficiency, play a basic role in water allocation. Some legal and institutional changes are needed, for example to simplify the transfer of water rights from one use to another, and to permit user charges to be imposed on the withdrawal of ground water. The latter would provide a basis for rationing the supply, and assuring that the full costs of water withdrawal, including the costs of future uses foregone, or of replenishing the supply from another source, are paid by the beneficiaries. The revenues from user charges might be used to develop an alternative economic base for the community or to pay for importation of water, artificial recharge, and other conservation measures.

Beneficiary-Pay Principle

The market mechanism provides signals to produce more or less of a certain good as its price varies with demand. The Commission believes that the market mechanism should be adapted to goods and services produced by publicly supported water resource development so that consumer demand for those products is directly measured by a price system. Hence the Commission recommends collection of user charges and use of other cost-sharing devices to recapture from users and other directly identifiable beneficiaries their respective shares of the full costs of public water resource developments from which they benefit.

Conservation of resources and protection of the environment are promoted by this pricing system, for development will take place only if the users believe that the benefits will exceed the costs, including the environmental costs. A much closer calculation of benefits and costs is likely to be made if the user is paying all of the costs rather than just a fraction or none of them, as is the present practice. The beneficiary-pay principle also promotes equity in that those who benefit from the development pay the costs rather than shifting them to the general taxpayer who may receive no benefit.

It has been argued that subsidized water and water resources projects foster social justice by redistributing income to low-income families; that user charges and prices are regressive and thus tend to discriminate against the poor. Therefore, the argument is that water and water-related services, so often provided by government, should be financed out of general tax revenues.

The Commission has not found convincing evidence that cost-based pricing results in increasing the relative burden on the economically disadvantaged. There is even some evidence that subsidies in the form of underpriced water services disproportionately benefit the economically advantaged. Ability to pay does not enter into the conventional marketplace. A pound of sugar is priced the same for the millionaire as for the pauper. If the objective is to help the poor by income redistribution—an objective the Commission believes valid—subsidized pricing of goods and services in selected industries such as water and water-related services is hopelessly inadequate to achieve that end.

The principle that economic efficiency is encouraged by requiring users or other directly identifiable beneficiaries of projects to pay costs of water resource developments finds a number of specific applications in the main report:

Application to Inland Waterways: At present, users of the Nation's inland waterways pay neither their capital nor their operating costs. For such facilities constructed in the future the Commission recommends that directly identifiable beneficiaries should pay construction costs with interest, and that



*Agricultural consumption of water
upstream from a powerplant reduces
hydroelectric power benefits.*

users should pay operating and maintenance costs. As to such facilities already completed, the investment has been made and the economic objective should be to keep them in use if users can afford to pay the upkeep. Hence the Commission recommends the collection of user charges to cover only operation and maintenance costs of existing navigation facilities on inland waterways.

The fact that some waterways have contributed greatly to the prosperity of a region, or the Nation, should not lead to the conclusion that all waterways are, or will be, economically justified. The policy of Federal assumption of practically all navigation costs which was established during the last century needs to be adjusted to take into account the radical change in the Nation's transportation system in the last few decades. User charges have been recommended by every President since Franklin D. Roosevelt and are long overdue. The Commission recognizes that waterway transportation is but one component of the complex transportation system of the Nation. It will therefore be necessary for the Federal Government to develop a national transportation policy to encourage more efficient use of the various land and water elements of the system that have already been constructed, to prevent rates on some routes from being set artificially below costs, and to promote better resource allocation in the planning and construction of new components of the system. The user charges collected from inland waterways should be imposed gradually and increased progressively during a transition period, at the end of which the full operation and maintenance costs should be recovered. At the same time, the Interstate Commerce Commission or a successor regulatory agency with authority over all modes of transportation should regulate the various transportation rate structures in accordance with a

national policy which emphasizes full-cost pricing by all modes of transportation and efficient use of the total transportation system.

Application to Water Supply Projects: Projects to supply municipal, industrial, and agricultural water should be authorized in the future only when provision is made to recover total construction, operation, and maintenance costs allocated to water supply from the beneficiaries of the project, with interest at prevailing rates on the unpaid balances of construction costs.

The recommendation applies to all water supply projects, including interbasin transfers. An interbasin transfer is no different in kind from any other water supply project; the difference is in degree only. However, because of interstate effects, particular attention must be paid to the costs imposed on the area of origin. Curtailment of uses in the exporting region is part of the real cost of an interbasin transfer. Therefore the price tag on an interbasin transfer should include those net benefits foregone, and the beneficiaries in the importing region should be required to pay them as part of project costs. Such losses include not only diminution of production from existing facilities (e.g., a hydroelectric powerplant) but also losses from diminished instream uses such as fish runs. Preclusion or curtailment of the most likely alternative future use in the area of origin is also an additional cost, according to sound evaluation procedure. In other words, benefits generated by an interbasin transfer should exceed the full costs of the transfer plus the net benefits which that same water would have generated in the area of origin. If an interbasin transfer will generate \$10 million of annual benefits in the receiving area and cost \$8 million annually to build, operate, and maintain, the annual net benefits precluded in the area of origin should be less than \$2 million in order for the transfer to be feasible.

With respect to municipal and industrial water supplies, the Water Supply Act of 1958 states that it is "the policy of Congress to recognize the primary responsibility of the States and local interests in developing water supplies for domestic, municipal, industrial, and other purposes." Similar language is found in other laws. Yet in the legislation authorizing various water supply programs the Congress has created a bewildering array of Federal subsidies for the purpose of shifting much of the responsibility for, and the costs of, municipal and industrial water supplies to the Federal Government.

There is no evidence that would lead the Commission to believe that design and construction of local water supply systems merit subsidy or would be better performed by Federal construction agencies. Local government has demonstrated the capability to design and construct the most sophisticated systems when adequate financing is available. Moreover, when a community must meet its own needs for water supply, it is much more likely to charge the water users the full cost of providing the service and thus capture some of the advantages of managing water systems as self-sustaining, utility-type enterprises.

Finally the Commission has concluded that there is a considerable element of inequity in the policies that presently govern the programs through which grants and low-cost loans are made available to communities. Under these programs, communities that have been conscientious in planning, and diligent in building water supply facilities will be unable to demonstrate an urgent need for assistance and for this reason will be denied grant funds. Other less conscientious communities that through their own dereliction find themselves with inadequate supplies will be able to demonstrate urgent need and, accordingly, will be awarded grants. This is not calculated to instill in the Nation's communities a resolve to provide for themselves those services which are appropriately a local responsibility and which, in the absence of extenuating circumstances, should not be subsidized.

Application to Programs to Increase Agricultural Production: The Federal Government now supports three kinds of water-related land reclamation programs to serve agriculture: irrigation of dry lands, drainage of wetlands, and flood protection of bottom lands. All three are heavily subsidized by Federal taxpayers. In recent decades, these same taxpayers have been burdened with the costs of paying farmers to hold down production of crops, often on the same lands reclaimed with Federal subsidy.

Subsidized Federal water resources development projects encourage wasteful use of water. Where water is priced substantially below cost, it may be to the irrigator's advantage to be lavish in the use of water and to neglect programs that improve productivity.

The Commission's studies suggest that subsidized reclamation programs are not needed now and are unlikely to be needed in the foreseeable future. Forecasts covering a wide range of alternative futures suggest that the existing land base is adequate to meet food and fiber demands of the Nation at least until the year 2000. Even if demand for food and fiber exceeds the high range of those forecasts, the demand can be met most efficiently without subsidies. If the Nation concludes that steps should be taken to increase production of food to prevent possible future shortages, or to feed the world, the Commission believes the proper policy would be a national or world program for food storage, such as a national or a world food bank.

If for any reason a need should arise for more farm land in the United States, the sensible solution would be to allow a free and unsubsidized market to meet the need in the most economic manner. That might or might not involve bringing new land under irrigation or draining and protecting new land from floods. It should depend on what proves to be the least-cost method of increasing farm production at the time. The cost, in any event, should not be borne by the taxpayers, but should be incorporated into the price of the crops.

The argument has been made that subsidized water programs for agriculture lead to lower food prices for consumers and therefore are

economically justified. The evidence suggests otherwise. For those crops which come under farm price support programs, prices at the food store will be as high as they would otherwise be. Furthermore, with greater production resulting from subsidized water programs for agriculture, more tax funds will be required to maintain price support levels and to underwrite the water project subsidies. Thus the consumer, who is also a taxpayer, loses.

For crops which are not under price support programs but which are grown on lands benefiting from Federal water project subsidies, food store prices might be lower but the combined social costs of producing such subsidized farm products (i.e., the price paid by consumers plus the subsidy paid by taxpayers) usually will exceed the costs which would otherwise prevail in the absence of the subsidy.

Even where subsidized irrigation does lower prices to consumers, national economic efficiency often will suffer. When farmers receive an irrigation subsidy, for example, they are able to sell their products at prices below the level required to cover all costs of production. This is because some of the costs are picked up by taxpayers through the subsidy. When this happens, more of society's scarce resources will be channeled into the production of subsidized products and away from the production of other products consumers want. Limited resources are diverted away from the pattern of production that yields the greatest utility to society.

The argument is also made that the Federal reclamation program of

When irrigators are subsidized crop production costs are lowered only because taxpayers have underwritten part of the costs.



subsidized irrigation and the 160-acre limitation on the size of eligible farms has fostered the family farm in America. For a variety of reasons and through a variety of means, the acreage limitation has been circumvented. The Commission has found no evidence that the acreage limitations attempted to be imposed upon federally subsidized reclamation projects have produced farming modes or cultural patterns substantially different from those in comparable farming communities outside such projects.

The Commission therefore recommends a national policy of eliminating the subsidy in irrigation, drainage, and agricultural flood control projects. The costs of these programs should be fully reimbursable, with interest, by the beneficiaries of the project. Full achievement of this policy will require many years because of existing contractual rights held by beneficiaries of projects already built. For new projects, the policy could be implemented at once.

Application to Flood Control Programs: It is natural to think that the way to solve the flood problem is to build levees, reservoirs, and other engineering works. This is particularly true after a spectacular flood or series of floods such as occurred in the Northeast in 1972 and on the Mississippi in the spring of 1973. And it is natural for Congress, in the aftermath of disasters, to turn to such positive means of control. Undoubtedly the construction of engineering works has reduced flood losses that the Nation would otherwise have suffered, and many such works have resulted in benefits exceeding their costs. But despite the expenditure by the Federal Government of more than \$8 billion (substantially more in terms of 1973 dollars) on dams and levees to reduce flood hazards to industrial, municipal, and residential use of flood plains, average annual damages from floods are increasing because use of flood plains is increasing. It is time, therefore, to reexamine Federal flood control programs. From the standpoint of economic efficiency flood plains should not be developed unless two tests are met. First, the net benefits of development should exceed the net benefits of developing flood-free land for the same purpose. Second, the benefits of development (the goods and services produced thereby) should exceed the costs of development, the costs of flood control measures, and the losses caused by floods. Under present practice the costs are not fully borne by those who locate in flood plains. Flood control measures are largely subsidized and losses may be reduced by flood insurance partially subsidized by the Federal Government. Even if the visible out-of-pocket dollar costs could be fully recovered from direct beneficiaries there may be substantial unrecoverable environmental costs incident to the development of the flood plains and of the dams and levees to protect them.

The United States has made an heroic effort to protect the lives and property of those who already live on flood plain lands, and to maintain the flow of income that results from the use of these lands. Citizens in all parts of the Nation have seen billions of dollars spent to help fellow citizens vulnerable to loss of life or fortune. But through the years this benevolent

effort has been under way, others have been busily developing additional flood plain areas in such ways that the initial goal of rescuing those unfortunate enough to be endangered by floods has become less and less attainable.

For these reasons, the Commission recommends flood plain management as the Nation's primary future strategy to avoid flood loss. Where, after applying an efficiency test and weighing environmental values, physical structures are found to be the best alternative for avoiding flood losses, then so far as practicable, construction, operation, and maintenance costs should be recovered from direct beneficiaries.

In spite of assertions to the contrary, the Commission believes that it is feasible to identify flood control beneficiaries and to assess direct costs against them. In order to justify a Federal flood control project it is necessary to demonstrate that benefits exceed costs. Since this requires estimation of the benefits accruing to all parts of the flood plain, all of the information needed to identify beneficiaries and assess costs will be available for every project for which a proper economic evaluation has been made. For many years drainage districts and other public improvement districts in the United States have been successfully solving assessment problems that are more complex than those stemming from the construction of flood protection works.

Application to Recreational and Environmental Benefits: Under present policies recreational and environmental enhancement features of water resource projects are not fully reimbursable. An argument supporting this policy is that the benefits are entirely "national," that society benefits but conventional markets and pricing mechanisms cannot accurately reflect the costs and therefore no group of individuals should pay for them. In some instances, for example in behalf of wild rivers, the argument is persuasive. But a portion of Federal water resource expenditures has gone to provide facilities for fishing, boating, and water skiing where it is difficult to see why those who enjoy those pastimes should not pay the costs attributable to the project purposes from which they benefit. As previously noted, collecting for these benefits will give a truer measure of the real demand for them and will promote equity by relieving the general taxpayer from providing services he does not use.

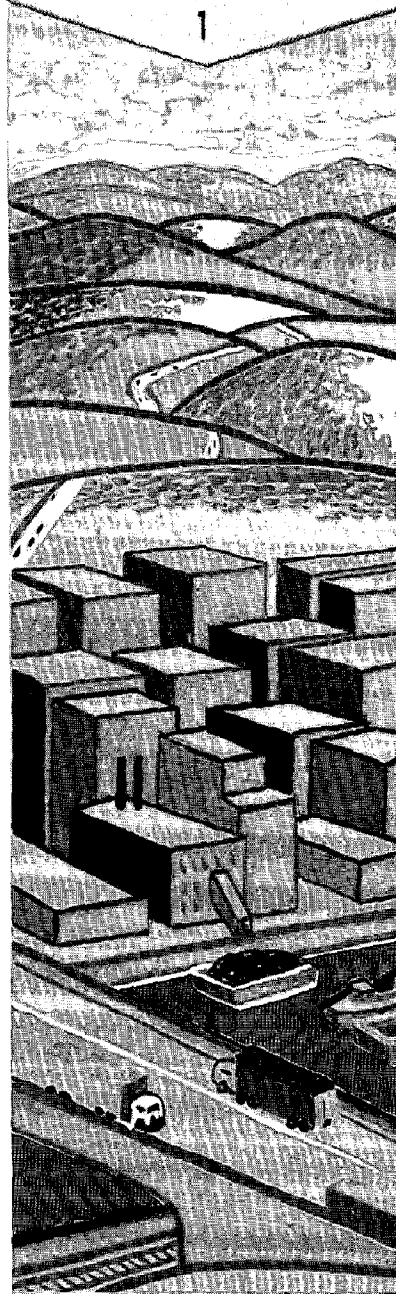
In some cases owing to the nature of the facility it is difficult to collect user charges, and the costs of attempting to do so may approach or exceed revenues. One indirect means of solving this problem with respect to recreational purposes is to place an excise tax on certain kinds of recreational equipment. In many cases, however, recreation users can be identified and reached and should be charged admission or user fees to recover capital, operation, and maintenance costs of particular recreational facilities.

5 NEW SUGGESTED NATIONAL WATERNOMICS POLICIES

INLAND WATERWAYS

Users of inland waterways should pay costs of operation and maintenance. On future waterway projects, beneficiaries should repay construction costs with interest.

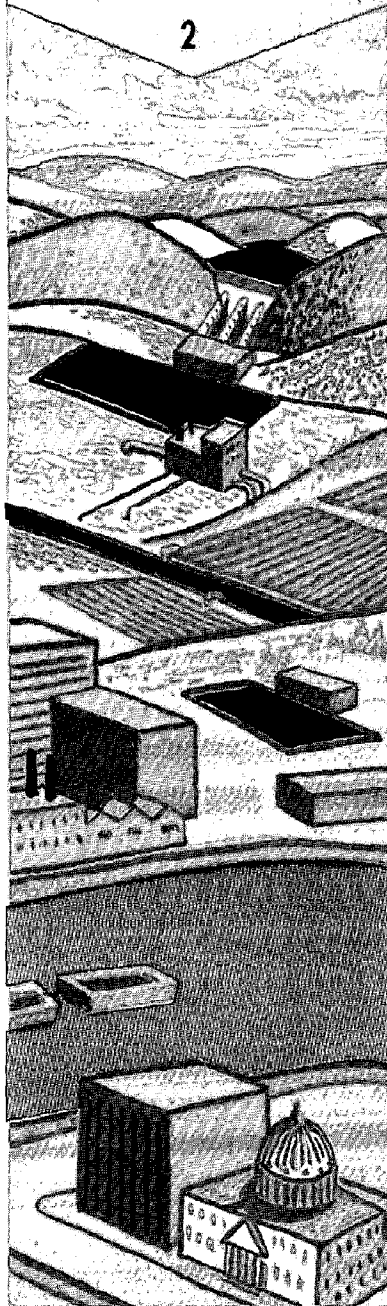
The Federal Government should develop a national transportation policy, encouraging more efficient use of all modes of transportation.



WATER SUPPLY PROJECTS

Future water supply projects for municipal, industrial and agricultural water should only be undertaken if all costs of construction, operation and maintenance can be recovered from beneficiaries.

2



AGRICULTURAL LAND ENHANCEMENT PROGRAMS

Subsidized reclamation programs place an unfair burden on taxpayers. Agricultural water projects, such as irrigation of arid lands, drainage of wetlands, and flood protection for bottom lands should be paid for in the price of the crops.

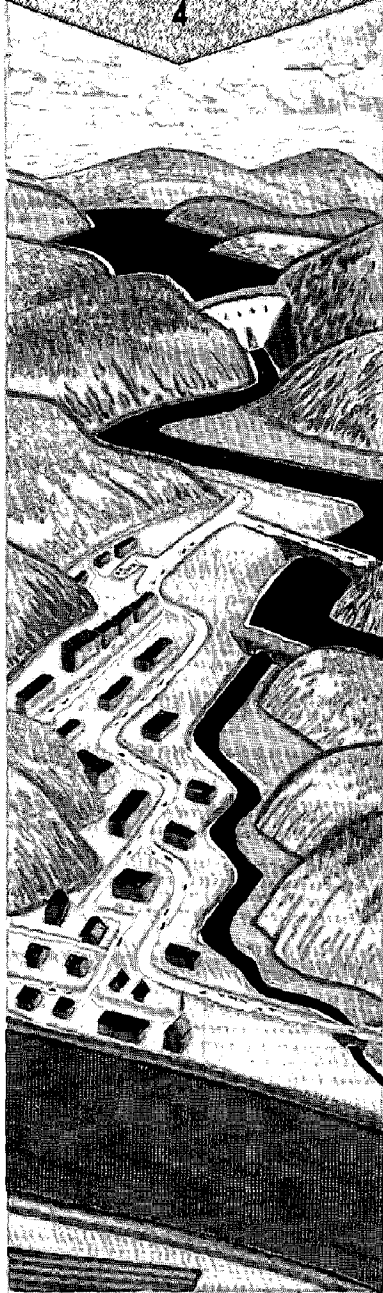
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FLOOD CONTROL

Costs of flood control projects such as reservoirs, dams, and levees to protect flood plains often exceed the cost of developing flood-free land. Costs of flood control projects should be paid for by the beneficiaries.

4



RECREATIONAL BENEFITS

Where Federal tax money is used to provide recreational benefits the users should repay costs through direct user fees and excise taxes on some recreational equipment.

5



ENVIRONMENT

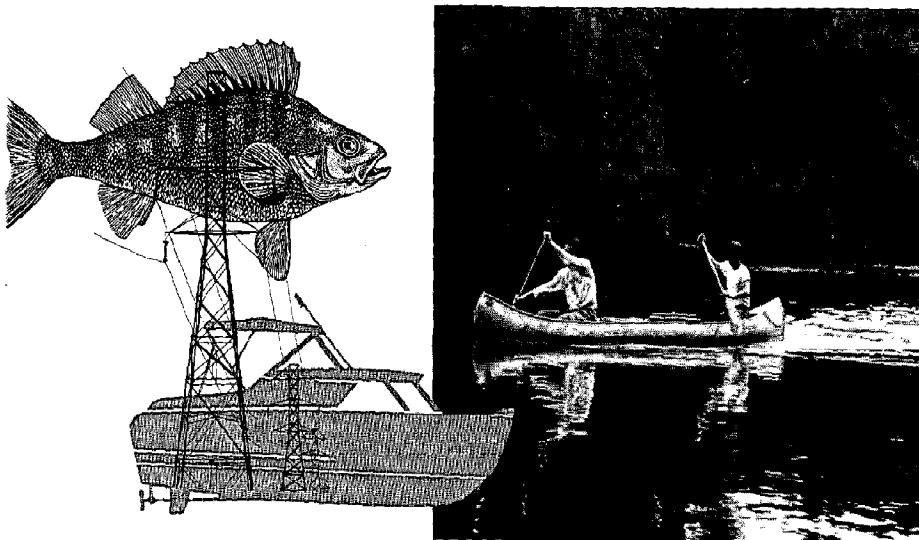
To speak of the environmental effects of man's development activities is to speak of a variety of consequences, some good and some bad. The construction of a dam and reservoir may be used to illustrate the point. The development could affect:

- (1) the biology of the natural environment—some ecosystems could be damaged and others benefited;
- (2) the recreational potential of the area—white water canoeing might be eliminated while water skiing is made possible;
- (3) the esthetic values of the area—a canyon beautiful to some for its colorful formations could be inundated to form a tranquil lake, equally beautiful to others; and
- (4) the spiritual feelings some people hold for the area—some might experience a sense of esthetic loss if a dam obliterated a unique geographical or historical place of interest while others might feel a sense of pride or accomplishment in the building of a structure, the taming of nature, the creation of employment, and the provision of additional usable supplies of water and energy.

As diverse as the environmental consequences of development may be, ranging from ecological effects to attitudinal responses based on philosophical concepts of value, they reflect a shared national concern for the effects of environmental change on people—on their life support systems, their standard of living, their recreational opportunities, and their spiritual well-being. It is often a matter of people's preferences for one set of values over another. But it may also be a matter of man's ability to keep the planet Earth in a healthful and agreeable condition in which he and his descendants can live and prosper.

Analyzing environmental controversies as conflicts in value preferences has led the Commission to three basic conclusions:

- (1) that the balancing of development and environmental values is



- properly conducted through the political process because the decisions raise questions of public policy;
- (2) that in general there is an urgent need for better data from which the environmental and developmental consequences of a proposed use of water may be forecast; and
 - (3) that nevertheless, until better data are available, it will be necessary to make decisions expeditiously which balance developmental and environmental values on the basis of the best available information.

This analysis stresses a rational decisionmaking process that takes into account both environmental and developmental values. Unnecessary damage to ecosystems should be avoided, scenic and esthetic values should be protected, and resource management should seek to enhance the quality of renewable resources and conserve depletable resources. If sound economic principles are applied to resource development and management, the total social costs of development, including environmental damages, will be charged to the beneficiaries. This will lead to a more nearly optimal allocation of resources, indemnifying society for injuries suffered, and striking a balance between development and preservation.

The Commission believes that careful planning frequently can accommodate important developmental and environmental values into harmonious solutions. But it recognizes that in special cases difficult choices must be made among important environmental and developmental values where all such values cannot be accommodated. Even then, however, it is possible to achieve a sound balancing of values, without unnecessary delay, through the use of appropriate procedures.

In considering a proposed water project or use, developmental values should not be sought irrespective of environmental values which will have to be omitted as a result; nor should any single level of environmental quality be protected irrespective of potential developmental values. Where important

*Use of the National Environmental Policy Act
as a "tool" for better land use and water planning can
serve society's interests and prevent unnecessary delays.*

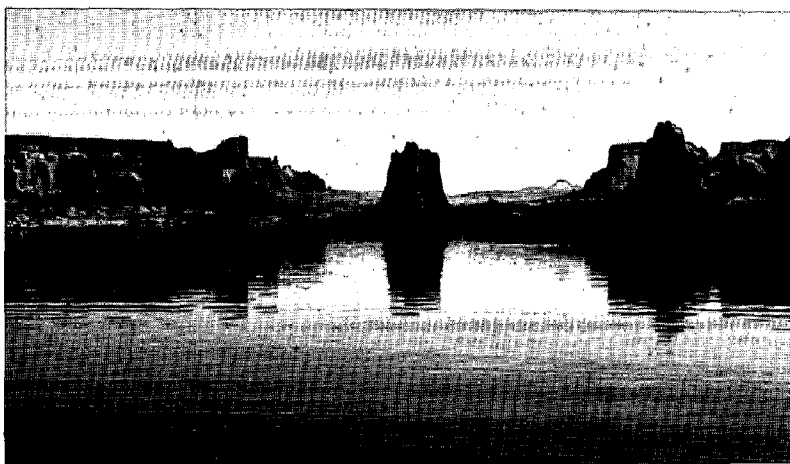
environmental and developmental values conflict and cannot be reconciled, the attainment of one must be viewed as a trade for the other. Sometimes it will be rational to make substantial environmental concessions; other times it may not be worth even a small concession. Only where the social benefits of what is to be gained outweigh the social costs of what is to be lost should a proposed project or use be sanctioned.

The emphasis the Commission puts on the rational decisionmaking process stems from its belief that the problem the Nation faces is not so much an unawareness or disregard for environmental values as it is a problem of obtaining information about the full environmental consequences of proposed alternative actions, and weighing the costs against the benefits of each. The Commission does not suggest that environmental values and development values will invariably conflict. Development can often proceed in harmony with the natural environment and their compatible relationship can usually be enhanced by thoughtful planning that respects the natural setting. Nevertheless, value conflicts will arise and procedures must be available to settle them.

Environmental Procedures—The National Environmental Policy Act

The environmental evaluation process required by the Federal Government and by some States is in accord with this analysis. The National Environmental Policy Act of 1969 (NEPA) is the basic law governing both Federal development and non-Federal development regulated by Federal licensing. It applies, of course, to water development projects.

NEPA requires Federal agencies to develop full information on both developmental values (e.g., alternatives to the specific proposal) and environmental values (e.g., ecological effects), and to use the information in planning and design. Where conflict between development and the environment cannot be avoided, NEPA provides standards and procedures for conflict resolutions. Section 101(a) of NEPA declares that it is the continuing policy of the Federal Government to establish conditions under which man and nature can exist together in productive harmony and to fulfill the social and economic aspirations of present and future generations of Americans. The succeeding sections of the Act call for measures to attain a wide range of beneficial uses of resources without degrading the environment. The means of achieving these ends is to require all Federal agencies—both construction agencies and licensing agencies—to generate information on the environmental impact of major Federal actions, to use that information to minimize conflict, and where conflict nevertheless occurs, to resolve the conflict by balancing the advantages of development against the disadvantages to the environment. The process is one of balancing benefits and costs, economic



and environmental, in which decisionmakers develop and display the information necessary to establish those benefits and costs together with the rationale for reaching the decision.

There are, however, some defects in procedures for administering NEPA which can be epitomized in the phrase "unnecessary delay." Delay in itself is not bad; the time taken to gather the best available information on developmental alternatives and their comparative effects on the environment is well spent, for a comprehensive assessment should prevent costly mistakes. Delay becomes unnecessary and undesirable when development proposals are subject to multiagency review and numerous appeals that often overlap and rarely develop new information. This kind of delay, or even the threat of it, can force unwise decisions.

Problems of delay may be especially serious in licensing proceedings of water or water-related projects, particularly where an applicant must obtain several licenses from different agencies. Society's interests are not well served if a licensing agency is forced to act precipitately in a context of crisis inflamed by delays, or if a license applicant is forced to change the plans or project proposals, not on their merits, but simply to avoid further delay. Society's objective should be to accommodate interests of the public and rights of the parties in order to produce a sound result in licensing proceedings, and to do so expeditiously.

Changes in the law could reduce unnecessary delay without impairing the law's effectiveness. As presently written, NEPA requires that Federal agencies consider alternative courses of action. Confusion arises over how far agencies must go in identifying, developing, and evaluating alternatives; the procedures for making that investigation; and, perhaps most importantly, the means of uniting the responsibility for considering alternatives with the authority to act on the alternative judged best. Congress should remove the confusion. At the least the Federal agency considering a license application should be given authority to license any alternative which it considers. Further, Congress should authorize the agency to limit the number and types of alternatives to be considered. Typically the issue of which alternative project is preferable is tied to the issue of which site for the project is preferable. Thus better land use planning, including the designation of sites for various types of projects and economic activities, would be an important tool in effective implementation of the policies of NEPA.

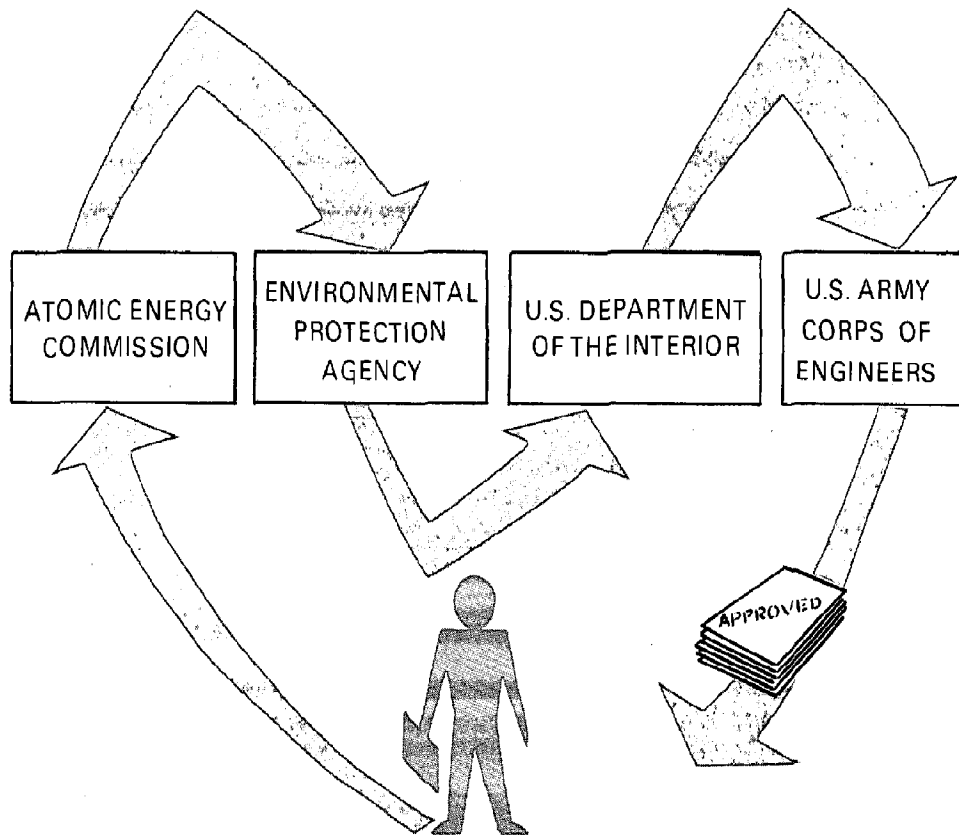
For private development, environmental analysis and evaluation should occur at the time of licensing. NEPA procedures should be integrated into the licensing proceedings. Specifically, licensing agencies should make the staff environmental impact statement available to the public at the time the hearing is announced. Adequate time for study of the impact statement should be allowed before the hearing is held, and both written and oral comments on the impact statements should be filed with the hearing examiner before the hearing. The hearing should be legislative in nature and all consequences of granting the license should be inquired into at that time.

Subject to agency and judicial review, the examiner's decision should determine both the licensing and the NEPA issues in the case, and collateral attack should be prohibited.

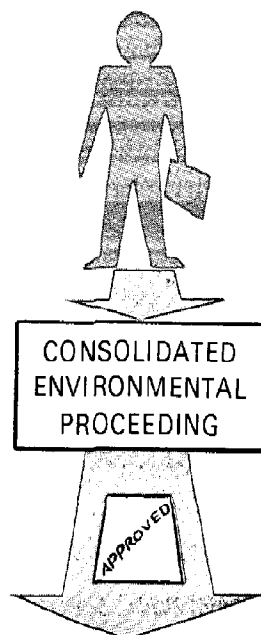
Another cause of unnecessary delay is the obligation many project sponsors face to obtain multiple certificates, licenses, permits, and approvals from governmental agencies at the Federal, State, and local levels, all subject to judicial review. At the Federal level alone, an applicant for a single project might be required to appear before the Atomic Energy Commission (on nuclear safety questions), the Environmental Protection Agency (on effluent limitations), the U.S. Department of the Interior (to cross public lands with transmission lines), and the U.S. Army Corps of Engineers (for a dredge and fill permit). Not only must each agency perform its licensing task but it may also be required to consider the environmental effects of all aspects of the proposed project. These procedures result in wasteful duplication of efforts as well as unnecessary delay. The Commission recommends consolidation of various Federal agency proceedings into a single proceeding conducted either by a designated lead agency or by a special tribunal with power to resolve all issues presented by the application. The agency decision should be subject to a single judicial review proceeding, beginning in a Federal circuit court of appeals.

The problem of multiple proceedings at the State and local level is more difficult to solve. Some States have adopted "one-stop" licensing, but the general picture is a maze of local and regional land use controls, of regional and State pollution and other environmental regulations, and of multiple administration by a number of different agencies. The Commission urges the States to consolidate their procedures to provide for a single certification proceeding in which all questions of siting and other environmental effects of a project are determined. Such a decision could specify a limited number of acceptable sites, and this determination could properly define the alternatives to be considered by the applicant and by any Federal licensing agency. The State certification proceeding should take place well ahead of the date construction is planned to begin, and the planning process should be started long in advance of that date, with ample opportunity for the public to participate in it.

The Federal role in the siting process may be more difficult to assign, for while there may be strong local interests to be considered, there also may be interstate and Federal interests to protect, if, for instance, development has adverse interstate effects on air and water quality. The Commission recommends that each Federal licensing agency be authorized to enter into agreements with qualified State and interstate agencies to permit them to make final licensing and siting determinations, either independently or jointly with the Federal agency, in accordance with applicable Federal and State laws and regulations. However, any failure of the States themselves to solve the problem of unnecessary delay caused by multiple proceedings will create pressure for a Federal solution.



The delays and duplication of multi-licensing and environmental reviews could be eliminated by consolidation.



Publicly financed projects also encounter delays, but they are more often attributable to budgetary considerations than to environmental evaluation. The Commission believes that better projects can be produced if the planning of public projects provides greater opportunity for participation by the public and thorough consideration during early planning stages of the environmental effects of alternative solutions (including no project at all) to the perceived problem. NEPA is not now entirely adequate to do the job because it does not bring in the public during early stages, and because it leaves environmental evaluation to construction agencies whose mission is not wholly compatible with the task. The Commission recommends legislation to encourage public participation in planning at early stages, including field hearings and informal conferences and hearings; to require agencies to respond to comments on draft environmental impact statements rather than merely publish such comments; and to establish an independent Board of Review under the supervision of the Chairman of the Water Resources Council with duties that include determining whether a construction agency has complied with NEPA. If the Board of Review believes that inadequate attention has been given to environmental considerations, it should be empowered to have an environmental advocate explore neglected issues. In all events, the Board of Review should have authority to comment to the President and the Congress on the balancing of environmental and developmental values made by the agency proposing the project.

Careful planning, early and extended public participation, and thorough review ought to reduce the number of public projects embroiled in environmental controversy, but some projects will continue to provoke conflicts because they present basic value choices. In a democratic society these choices should be made by the legislative process. The procedures recommended would provide lawmakers with the information necessary for a considered decision. A legislature, too, should be able to use an advocate to develop additional information and points of view.

Water Pollution Control

The discussion of environmental protection has centered thus far on the means of resolving conflicts between developmental values and environmental values. The Commission feels compelled, however, to go beyond procedures for decisionmaking into a substantive discussion of what national policy should be in one aspect of environmental protection—water pollution control.

The development of the Nation has exacted a high price in the deteriorating quality of its water resources. Rivers, lakes, and coastal waters have been heavily damaged by the uncontrolled discharge of waste, by polluted runoff from urban, agricultural, and mining development, and by accelerated erosion and sedimentation. The condition of many of the Nation's waters is a national disgrace.

The Commission believes that for the next decade the primary national

water resource priority should shift from water development to the achievement of high standards of water quality. The Nation can and should achieve standards of quality for all of its waters which assure that these waters are suitable for the highest uses society wishes to make of them now or in the future.

The Commission is also convinced that a new ethic of conservation and reuse must replace the history of exponential growth in the production of waste. Its 4-year study of water pollution has demonstrated the environmental truth of the aphorism "there is no such thing as a free lunch." The Nation can no longer safely rely on "free" waste disposal to achieve its national development goals.

A successful strategy to achieve clean waters and reduce the production of unnecessary waste requires an understanding of the costs and benefits of alternative programs for water quality management and a recognition that these programs will have environmental and social impact beyond the particular body of water and its users. The Commission believes that the first step in establishing national policies for better water quality management is to identify the range of these effects.

Water is only one element in a total environment. It is generally recognized that improved water quality will enhance the immediate environment, augment the useful supply of water and reduce costs stemming from the use of polluted water. It is also necessary to recognize that matter can be altered but not destroyed and some processes which abate the pollution of water can pollute the air and land. The construction and operation of waste treatment systems consume scarce minerals and energy. The chemicals used in waste treatment are themselves products of a process which also creates wastes. These chain effects mean that a large expenditure of resources to produce a small improvement in water quality may turn out to be counterproductive when total environmental consequences are considered.

Water quality is only one of many goals for a whole society. Public expenditures for water pollution abatement must compete for limited tax moneys with social demands for housing, education, medical care, slum clearance, full employment, and price stability.

Water Quality Standards and "Zero Discharge": The goal which the Nation sets for water quality will determine the nature of the policies and programs developed to achieve that goal. The national goal for water quality should be one which is attainable and which will permit continuous weighing of the environmental and social costs of water quality management programs against their environmental and social benefits. The Commission believes that the national water quality goal should be the achievement of standards of water quality which will assure that public water bodies are suitable to accommodate the highest uses society wishes to make of them at present or in the future.

To be effective these water quality standards should be coupled with a rigorously enforced permit system which clearly specifies the acceptable quality of every effluent source, and regulation which requires every discharger of waste to employ methods of waste disposal which will permit the standards to be met, or modify his processes so that discharges of objectionable wastes are eliminated.

The regulations should prohibit the discharge of toxic material and of substances damaging to downstream users or to the natural biota of the stream. The regulations should recognize that streams have a self-purifying capacity which allows them to absorb some kinds of discharges in reasonable quantity without harm.

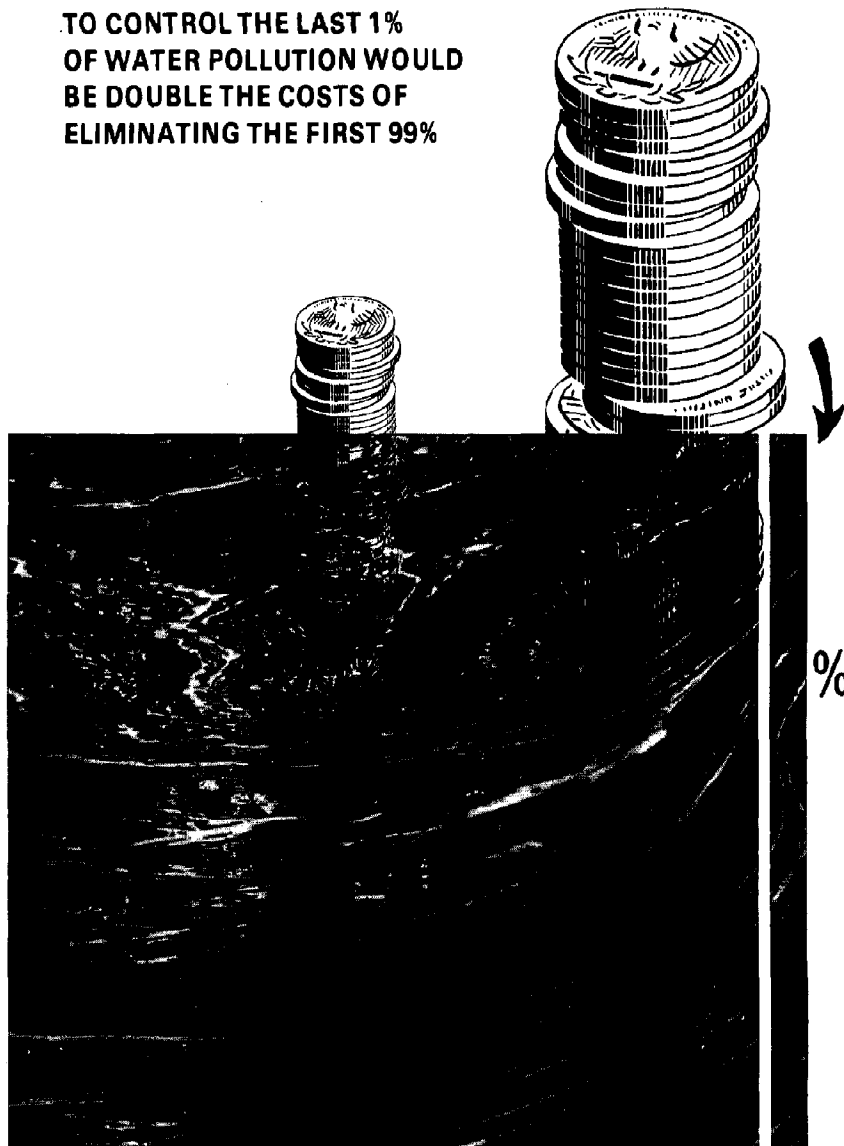
The Federal Water Pollution Control Act Amendments of 1972, while making landmark improvements in the Nation's attack on water pollution, have made a fundamental error in establishing as a national goal the elimination of all pollutant discharges into national bodies of water by 1985. This "zero-discharge" policy has strong emotional appeal, but in the Commission's judgment is an impractical and unattainable goal. Striving to achieve it will involve exorbitant costs, confusion in planning, misallocation of resources, and will risk public disillusionment with the entire national effort to protect the environment.

The benefits from most waste treatment processes are subject to severely diminishing returns; costs increase exponentially. To clean up the last 1 percent of pollution involves, on average, a doubling of the very large costs of eliminating the first 99 percent. These costs of achieving the no-discharge goal must be viewed in terms of the sacrifices society will be compelled to make in other social demands and in terms of the large amounts of scarce energy and natural resources which will be consumed. Finally, elimination of the last increment of water pollution is likely to have serious offsetting waste disposal impacts on air and land. These adverse impacts on land and air may be far more damaging to the environment than the retention of some small amount of water pollution, particularly in areas where the self-purifying capacity of water is great and where other uses of water are not adversely affected.

Making use of the natural capacity of running water to purify itself of some kinds of wastes in limited quantities does not preclude simultaneous or sequential use of the water for other purposes, except where the preferred use is to preserve a water body in its natural condition, as in the case of a wild or scenic river. Water quality standards should vary depending on the alternative uses desired for the water: Drinking water requires high standards, navigation practically no standards at all. In the Commission's view a water quality control program should endeavor to ascertain the economically desirable and the socially preferred uses of specific water bodies and set quality standards in relation to the preferred uses. To adopt a "zero-discharge" policy for the return of all waters to their natural state precludes the use of waters for waste disposal purposes in circumstances where that use is environmentally and

THE IMPRACTICABLE 1985 ZERO DISCHARGE GOAL

TO CONTROL THE LAST 1%
OF WATER POLLUTION WOULD
BE DOUBLE THE COSTS OF
ELIMINATING THE FIRST 99%



\$

ESTIMATED COSTS FOR
EACH PERSON IN THE U.S.
TODAY WOULD BE OVER

2,200 BY 1983



economically sound, socially acceptable, and utterly rational.

For example the assimilative capacity of water can have high utility under some conditions in dispersing and dissipating waste heat before it is rejected into the atmosphere, as ultimately all waste heat must be. Where heat input into water will adversely and substantially affect important aquatic life or other environmental values, limitations or complete prohibitions must be imposed. But to deny the use of water as an interim medium for thermal release under all circumstances could cause serious adverse environmental, as well as economic, repercussions. Regulations which deny the ability of water to assimilate any waste would probably require thermal powerplants to use dry cooling which results in negligible consumptive losses of water and no heat discharge to water. Unfortunately, not only are dry cooling systems quite costly to operate and maintain, they substantially reduce a powerplant's efficiency. Providing dry cooling for each new thermal electric generating plant expected to be constructed in the United States through 1990 would require the construction of additional installed capacity equivalent to about 40 powerplants of 3,000 megawatt capacity each just to provide the electrical energy necessary to operate the cooling facilities. The additional energy consumption would be equivalent to 1 billion barrels of oil per year. Of course, the total amount of waste heat rejected into the atmosphere would be correspondingly increased.

The cost of meeting the 1972 Act's requirement of "best available technology" by 1983 is estimated by the Commission to be \$467 billion. This is about \$200 billion more than the entire Federal budget proposed for Fiscal Year 1974, including national defense. It will cost more than \$2,200 for every person in the United States today. This is more than double the costs required to meet the water quality standards established under the Water Quality Act of 1965, standards which the Commission believes represent a lofty but attainable aspiration. As costly as the "best available technology" objective may be to meet, implementation of a true "no-discharge" policy by 1985 or by any other date, if in fact such a policy could be implemented, would undoubtedly cost several times as much. For this massive investment and other associated social costs, the Nation would realize only marginal gains in the uses that could be made of its waters.

To achieve the type of water quality standards recommended by the Commission will not be cheap. The Commission's best estimate of achieving them 100 percent of the time for all point-sources of pollution is over \$200 billion. This is more than the Congress in its entire history has appropriated for flood control, navigation, hydroelectricity, reclamation, and other water projects. The cost of achieving this goal by 1983 would be even greater if inflation is not kept under tight control. The Commission believes that the substantial achievement of this goal is possible only if national, State, and local efforts are effectively combined and if the Congress decides that clean water warrants an appropriation level of almost \$13 billion per year over a 10-year period for the Federal Share.

Federal Grants for Pollution Control: A national financial commitment to achieve water quality standards is necessary because of the sheer magnitude of the long-accumulated backlog of work and the need to establish equity among the State and local governments which have been unevenly affected by prior Federal grant programs. Upon performance of this commitment the Commission recommends that the Federal grant program be terminated and local and State agencies once again finance the necessary extensions and improvements to their systems; the users of such systems should pay the costs.

The compelling reason for Federal participation in the cost of municipal waste disposal facilities is to get the job done nationwide within a reasonable time and to prevent local financial constraints from obstructing this goal. Prior Federal grant programs varied over the years as to appropriations and grant percentage levels. This caused some communities to delay action waiting for Congress to increase the amount of Federal construction grants. The 1972 Act seeks to eliminate this negative incentive by establishing assured grant funding through contract authority vested in the Administrator of EPA and by authorizing reimbursement to communities who paid for their own treatment facilities. To date, neither executive nor legislative branches have given the necessary commitment to these policies through appropriation and allocation. The Commission recommends that the contract authority and reimbursement provisions of the 1972 Act be fully implemented and that the Congress determine a realistic target date for the achievement of established water quality standards and provide that Federal grants be terminated on that date. Knowledge that the Federal grant program for local waste treatment facilities will terminate upon a date certain would be a powerful incentive to States and localities to get the job done by that date.

The high cost of achieving water quality standards requires that each Federal grant be cost effective. The 1972 Act should be amended to give the Administrator of EPA the flexibility to approve grants for situation-specific alternatives to conventional treatment processes or uniform treatment requirements when such alternatives can reasonably be expected to produce equal or better receiving water quality for the expenditure of a lesser amount of Federal funds.

Over the long term the Commission believes that wastewater treatment is a local responsibility and should therefore be financed and performed at the local (or regional) level and not by the Federal Government. This is not to say that either water quality standards or their enforcement should be left to local units of government, for it is clear that inaction by one community can be harmful to another. But the responsibility for compliance with the law can be placed on local governments and in the Commission's view should be. It should be remembered that until recently Federal financing played a minor role in pollution control. From the time records were first kept to June 30, 1971, a total of \$80 billion had been spent on publicly owned waste

treatment facilities and sewers (prices adjusted to September 1971 levels). The Federal contribution to that sum was only \$4.7 billion. Catching up with generations of neglect and meeting the vastly increased water quality standards which the Federal Government has set will require Federal help. Thereafter local governments can themselves finance waste disposal improvements by loans from the private sector, which can be repaid through user charges.

Paying for Pollution Abatement: It is sometimes argued that pollution is a national problem because all citizens have a stake in clean water; hence the Federal taxpayer should pay for all treatment plants. The Commission is not persuaded. By that logic everything is a national problem. It is inequitable to force taxpayers in communities which have paid for their own treatment plants to pay also for plants in communities that have lagged behind. The costs of pollution should be borne by those who create it.

The Commission espouses the "polluter-pay" principle because placing pollution costs on the polluters themselves provides an incentive to reduce pollution and because polluters impose part of their operating costs on others when they are allowed to dump their wastes without treatment into water bodies. If polluters escape payment of some of their real costs, their expenses are lower than they should be, and the costs of other users of the water body are higher. This results in a misallocation of resources which requires governmental intervention. The intervention should be directed at achieving the economic objective of making private costs coincide with social costs—that is, of requiring polluters to pay the costs they are imposing on others. The objective can be pursued by compelling users of wastewater treatment plants to pay the costs of treating their waste contributions to the system. Charges should be imposed on both householders and industries in proportion to the load that each imposes on the waste treatment system.

The Commission concludes that a system of user charges in combination with regulation of receiving water quality and waste water discharge will place the costs of water quality maintenance on those who occasion the costs, and at the same time protect water from pollution which will render it unfit for preferred uses. The Commission notes with favor that the 1972 Amendments recognize the polluter-pay policy by requiring all users to pay their proportionate share of operation and maintenance costs of wastewater treatment plants, and, further, by requiring industrial users to pay a portion of construction costs.

Responsibility for Regulation: The regulation of all point-sources of pollution is essential to the achievement of water quality standards. No discharger should be permitted to destroy or impair society's use of a body of water because of weakness or failure in the regulatory process.

Except where States are unable or unwilling to perform, they should have

primary, although not exclusive, responsibility for definition and implementation of water quality standards and for regulatory and enforcement actions in administering their respective portions of the Nation's water pollution control program. Federal agencies should not impinge on legitimate State and local functions which include setting the timeframe for implementation and issuing and administering the permit system so long as such State and local action gets the job done. The form of local government is a State responsibility and the 1972 Act should be amended to delete Federal requirements as to the organizational form of regional or metropolitan waste management agencies.

WATER-SAVING PRACTICES

Various measures can be taken to achieve physical savings of water, measures referred to generically as water-saving practices. In the arid and semiarid regions of the West, the greatest opportunity for water saving lies in irrigation, which accounts for more than 80 percent of total water consumption. In most Western States, water administrators have the power to prevent wasteful means of diversion and excessive application of water under a rule providing that beneficial use is the measure and limit of a water right. More vigorous exercise of this power would accomplish water savings. And more stringent definition of beneficial use would also help. By State legislation, or preferably under administrative authority, standards of beneficial use should be set, taking into account climatic, soil, and crop conditions. Similar standards on permissible water transportation losses should also be promulgated and enforced.

Savings in agricultural water use in the West will depend in part on modifications of State law to provide incentives for irrigators to conserve water. For example, a change from gravity-flow or surface-flooding irrigation to sprinkler irrigation often would reduce consumptive use, but as the law now stands in some States the water saved may go to other users. Hence, there is no incentive to conserve or stretch water supplies. Changing the law to create rights in salvaged water in favor of those who salvage it would encourage water-saving practices. Such laws should of course protect the rights of other users whose supply depends upon return flow.

It is also possible to save water in municipal and industrial use in many ways. Although the saveable quantities may not be potentially as large as in the case of crop irrigation, the cost savings by deferring new water supply projects could be impressive. Redesign of residential water-using appliances, such as toilets and washing machines, could produce worthwhile savings. There are also large potential savings from industrial technologies. Process changes can effect substantial reductions in the amount of water required per unit of output or per unit of raw material processed. For both domestic and industrial uses, the best hope of improving water conservation may lie in metering and pricing policies that require users to pay the full cost of water.



Requiring users to pay the full costs of water will increase awareness of its value

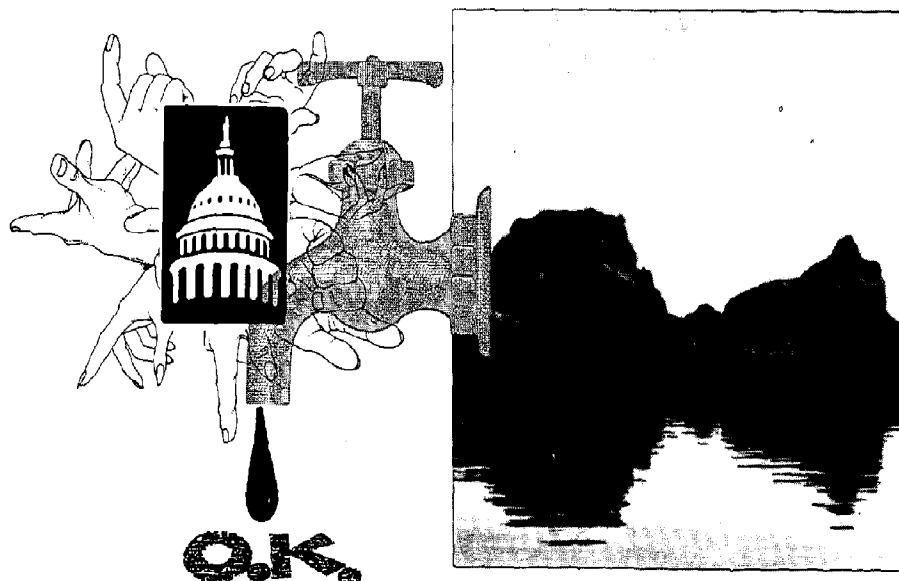
INSTITUTIONS AND PROCEDURES

The Commission devoted part of its efforts to a study of the complex arrangements—the institutions, procedures, and practices—by which water is developed and managed, without attempting to duplicate the more exhaustive studies of the President's Advisory Council on Executive Organization that dealt with the organization of the Federal Government. The Commission suggests changes only where missions appear to be outmoded or performance unsatisfactory, or where adequate institutions appear to be missing; that is, where there are tasks needing to be performed but lacking an institution to perform them. Changes in operating procedures are also suggested where the Commission believes existing procedures can be improved to secure better decisions, more promptly made.

Institutions

Water Resources Council: The Water Resources Council (WRC) is an interagency group of five cabinet officers and one independent agency head having major water responsibilities. Two other cabinet officers and the heads of several other independent agencies are associate members. The Council's major duties are to coordinate the water activities of the various Federal agencies and the States, to develop river basin plans for the Nation, and to assure that Federal water policies and programs are adequate to meet the Nation's demand for water and water-related services.

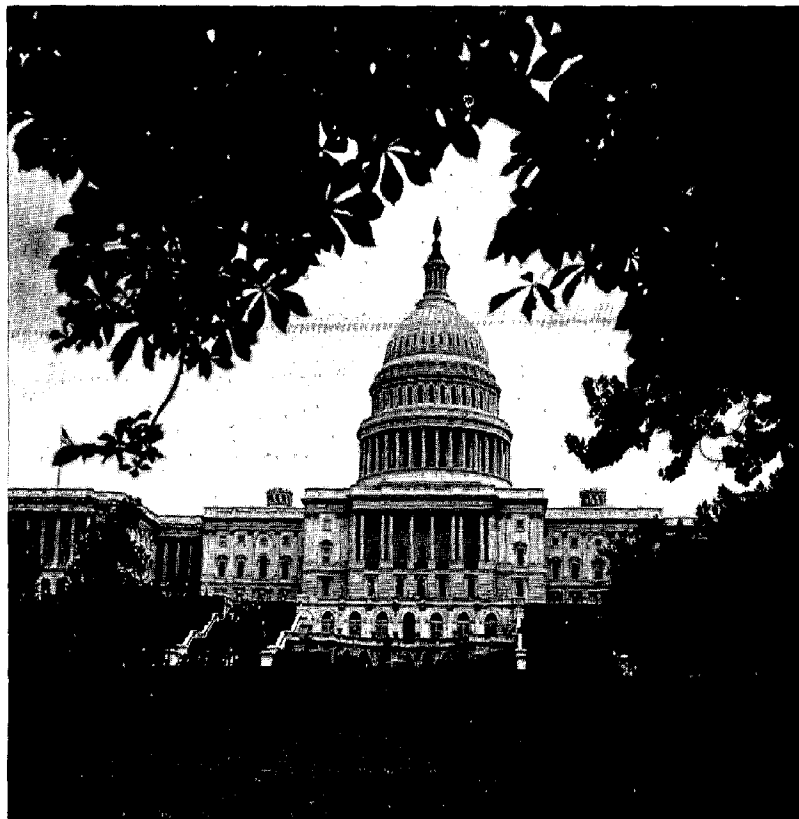
The Council's potential for leadership in policymaking and in planning activities has not been realized. It operates on the basis of consensus, it has no enforcement powers, and it neither confronts difficult policy issues nor resolves interagency conflicts. To strengthen the WRC, the Commission recommends that it be placed in the Executive Office of the President with an independent full-time Chairman who should also serve on the White House



staff as a presidential advisor on water resource matters. By making the Chairman independent instead of a Department Secretary as at present, and by giving him the status of a presidential advisor, WRC would have the benefit of a broader point of view in its deliberations and decisionmaking. The Chairman could speak for the President without fear that his department might be in contention with one or more other departments also represented on the Council. With presidential support the Chairman would be able to rise above departmental attitudes and policies in controversial matters.

The National Water Commission also recommends bringing into the Council several agencies which have been given water resource responsibilities since WRC was created. The Department of Commerce is responsible for certain marine resources and fosters industrial and other economic development involving substantial water use. The Department of Housing and Urban Development is concerned with urban planning and therefore with river basin planning; it also administers the flood insurance program. The Environmental Protection Agency has the major responsibility for water quality programs. The chief officer of each should become a full member of WRC and the Department of Health, Education, and Welfare, which no longer is responsible for water quality, should be made an associate member.

With these organizational changes, greater responsibilities could be given to WRC. Land use planning and water resources planning should be integrated. Water resources planning is important, but it is only one aspect of overall resources planning to satisfy social objectives. In the future, land use planning will almost certainly become the dominant activity with water resources forming a subordinate part of comprehensive plans. WRC should have a leading role in the Federal Government's planning activities and its planning should be integrated into licensing proceedings and grant programs relating to land and water use. WRC's budget requests should be prepared by the



Chairman in consultation with, but not necessarily with consent from, other Council members. Funding of water resource planning under WRC auspices should be the responsibility of WRC and not of member Departments and agencies. Under the present arrangements, mission agencies control the planning funds, thus denying the Nation the broadest perspective on water resources conservation and development, since alternatives outside the authority or the interest of the mission agencies tend to receive inadequate attention.

Coordination of grants to States for water and other related resource planning would produce more comprehensive and better integrated plans and programs. Under the present practice, State and local governments apply to a number of Federal agencies for water planning and program grants, and one grant agency is often unaware of the actions of another. If all State and local applications to Federal agencies for resource planning grants were consolidated each year into a single grant application handled by WRC, as the Commission recommends, the effectiveness of the planning dollar would be enhanced.

Independent Board of Review: Existing institutional arrangements for development of water projects are unsatisfactory. At present, the Federal agencies responsible for the design, construction, and operation of water resource projects, primarily the Corps of Engineers, the Bureau of Reclamation, and the Soil Conservation Service, are also responsible for evaluating those projects. Questions about the objectivity of the evaluations necessarily arise. The appearance of impartiality is lacking, whatever the fact may be.

The Commission recommends the establishment of an Independent Board of Review to evaluate water resource programs. Prior commissions have made similar recommendations, but no action has yet been taken. The urgency is even greater today. Many of the best projects have already been built, water resource projects cost more, and competition for the tax dollar is greater. It is particularly important to the success of many of the measures recommended in this Report that independent review of the feasibility and environmental consequences of water resource projects be provided. Construction agencies have a tendency to underestimate costs and exaggerate benefits of their proposed works. Neither the President nor the Congress presently has the staff resources to make sound evaluations of agency proposals. The Commission proposes that the Chairman of the reconstituted Water Resources Council become also the head of an independent board of five to seven members appointed by the President with the advice and consent of the Senate. The Board with the assistance of its staff, or staff borrowed from the WRC or recruited *ad hoc* from outside the Federal service for particular evaluation, should perform the following functions with respect to proposed projects, river basin plans, and grant programs:

- (1) Evaluate the economic efficiency of proposals and programs;
- (2) Identify and comment on the effects of proposals and programs on

other economic activities such as transportation, food and fiber production, and energy production;

(3) Compare the benefits from proposals and programs with other public investment opportunities;

(4) Identify the effects on income distribution of water resource development;

(5) Ascertain that alternatives, especially technological innovations, have been fully considered and adequately evaluated;

(6) Determine whether interested members of the public have been made aware of the proposal and permitted to participate in the formulation of plans;

(7) Appraise the adequacy of the evaluation of the environmental and ecological effects, good and bad, of the proposals and programs.

The Board should not have veto powers. Its function would be to inform the President and the Congress about economic, environmental, and technical aspects of water resource programs and to direct attention to policy issues arising from them.

These recommendations go far beyond review of specific projects. The intent is to establish a Board with a very broad, national perspective that considers water resource projects and programs in the broad context of competing demands for the tax dollar. Thus, not only would the Board review river basin plans to determine whether plans for one basin are in harmony with those for a related basin, but it would go further to examine the effectiveness of the grant programs, which now constitute the largest part of the water resources development investments of the Federal Government. For example, the Water Pollution Control Act Amendments of 1972 authorize the expenditure of \$18 billion for construction of municipal sewage treatment facilities between 1973 and 1975. Independent review of the operation of such large programs is highly desirable.

Changing Roles of Construction Agencies: The Commission recognizes that acceptance of its recommendations on economic and environmental evaluation of water resource programs would lead to reduction in construction work by the Soil Conservation Service, the Bureau of Reclamation and the Corps of Engineers. It is convinced that the maintenance of three separate design and construction agencies for water projects is wasteful of Federal resources. Many projects, moreover, are of a scale that can be most efficiently designed and constructed at the local level. Accordingly, the Commission recommends among other things that Public Law 566 (the Watershed Protection and Flood Prevention Act of 1954) be amended to eliminate the performance of engineering functions by the Agriculture Department under that Act. Also, the Bureau of Reclamation should be transformed over time from a construction agency to a management agency. The Bureau should finish construction on projects now under way, but it should begin deemphasizing its design and construction operations, and place priority

emphasis on its water management mission, emphasizing its knowledge and technical skills in making more efficient use of existing water supplies. If this expertise is developed the Bureau not only can improve the use of the water it supplies but also can assist other water supply agencies in improving their uses.

The Corps of Engineers should continue to design, construct, operate, and maintain major navigation, flood control, and hydropower projects that are beyond the capacity of non-Federal interests to manage. Construction and operation of municipal water supply and wastewater systems should be a local responsibility and the Corps should not be involved. The Corps should place greater emphasis on water management techniques and on nonstructural methods of reducing flood hazards and damages. It should continue its navigation responsibilities including operation and maintenance of existing facilities.

In the past, a number of study groups have recommended the unification of the Bureau and the Corps. The Commission sees no significant advantage in this recommendation if its other recommendations are adopted. With decreased emphasis on design and construction in both agencies, each can be left to assist its traditional constituencies to solve their development and management problems. No change in the role of the Tennessee Valley Authority is recommended.

Office of Water Technology: At present there is no single Federal agency responsible for broad research and development objectives in water resources technology, although specific research and development missions have been given to particular agencies such as the Office of Saline Water, the National Oceanic and Atmospheric Administration, the Environmental Protection Agency, and the various water construction agencies. An Office of Water Technology should be established in the Department of the Interior combining the functions of the existing Office of Water Resources Research, the Office of Saline Water, the precipitation modification and geothermal research programs of the Bureau of Reclamation, and the weather modification program of the National Oceanic and Atmospheric Administration of the Department of Commerce. The new Office of Water Technology should have the wide ranging mission of conducting research and development on the full array of technologies for providing alternative water supplies, including wastewater reuse. The Office should also be responsible for maintaining continuous technological assessment on ways of increasing water supplies and improving water use.

Data Gathering Services: Much of the controversy over the environmental impact of water resources development and over the licensing of water-related activities stems from insufficient knowledge about the prospective damages which might result from such projects and activities. Too little is known. Environmental interests are understandably reluctant to endorse projects when there is doubt about the environmental impact. An obvious way to

reduce doubts and permit all interests to proceed with greater assurance and certainty is to gain additional knowledge. This can be best done through carefully designed and adequately funded research on the ecology of the major water systems of the Nation whereby data are continuously gathered and analyzed. With such data, the Nation may know what is actually happening to its waterways, and may better judge the impact of proposed new water-using projects. The Commission recommends such an on-going program. Though its cost would be substantial, it might well produce large savings in more intelligent design of new projects or modification of existing projects.

Presently, the adequacy of basic data to support evaluation, planning, and decisionmaking in water resources is strongest with respect to the quantitative aspects. The areas of greatest present and future need are in the water quality, environmental, socioeconomic, and water-use aspects including improvement in the program of reporting flood damages. While great amounts of data are available, many potential data users do not have simple ways to learn what data are available, or how to obtain it. A well-publicized referral system is needed. There is also a continuing need to identify gaps in the present data base as they become apparent through planning and evaluation studies and through a periodic assessment of the adequacy of the data base. One means of accomplishing this would be for planning and project study reports to regularly report data deficiencies. Such a regular reporting of data deficiencies should also be part of the Section 102 statements filed under NEPA.

The gathering of water resources data is scattered among various Federal Agencies. The Commission recommends that the reconstituted Water Resources Council should establish a water resources data referral center and periodically publish an updated catalog of sources of water-related data. The Council should also inaugurate a program to identify deficiencies in the present data base. And the Congress should merge the National Oceanographic and Atmospheric Administration (except for its fisheries and coastal zone management activities) and the U.S. Geological Survey, the two agencies with the greatest water data gathering responsibilities, into a single administration in the Department of the Interior.

Regional and State Planning and Management Agencies: A great variety of Federal and non-Federal institutions have been created to plan, construct, and operate water facilities. This variety reflects strength, not weakness, because water problems, local conditions, and citizen preferences vary widely over the Nation. For intrastate streams, the Texas River Basin Authorities have been particularly successful and deserve the attention of other States having similar hydrologic and geographic conditions. Agencies like the Gulf Coast Waste Disposal Authority in Texas appear to hold much promise for attacking problems of water pollution in intrastate regions.

The problems of interstate streams are more complex. The Commission has reviewed the operations of *ad hoc* and interagency committees, river basin

commissions, federally chartered corporations, interstate compact commissions, and Federal-interstate compact commissions. The difference between the latter two institutions is the participation in the compact by the Federal Government as a signatory party. The Commission has concluded that the Federal-interstate compact commission, such as the Delaware River Basin Commission, is the most promising instrument for developing and regulating major interstate streams. The reasons for its effectiveness are twofold: (1) It provides for both the planning and the administration of water programs close to the people most affected by those programs, and (2) it has the advantage of participation by the United States in the planning and development of major streams in which the Federal Government will usually have navigation and water quality interests, and sometimes power and flood control interests as well. Such commissions will permit consideration if not reconciliation of conflicting interests. They will permit development of a comprehensive plan with provisions for optimal allocation of uses among alternatives, collection of user charges, obtaining financing, and regulation of related land uses. The negotiation, ratification, and consent to this type of compact is, understandably, a prolonged and complex process. Prior to negotiation and ratification of such compacts, good use can be made of River Basin Commissions under Title II of the 1965 Water Resources Planning Act, for the purpose of data collection, hydrologic studies, and planning.

The Great Lakes provide an excellent example of the potential utility of a Federal-interstate compact. The water quality of the Basin has deteriorated seriously. In response, a plethora of organizations has been created to deal with various aspects of the problem, with the result that large amounts of time are spent on consultation and coordination without producing policy decisions. The Federal interest is obvious; only the Federal Government can adequately arrange for cooperation with Canada. The Commission recommends that efforts be made by the President, working perhaps through a Great Lakes Task Force, to negotiate a Federal-interstate compact creating a commission with powers to cope with the Lakes' special problems.

Many streams, though interstate, are small enough not to substantially affect Federal interests. In such cases the ordinary interstate compact is an appropriate instrument for water management. To remove some of the causes of delay in forming these compacts, the Commission recommends that Congress enact legislation giving advance consent to compacts not involving Federal interests and providing that such compacts become effective 90 days after submission to Congress unless within that time Congress denies consent. To assure judicial enforcement of compacts, Congress should enact legislation to waive sovereign immunity of the United States in cases arising under compacts. To avoid burdens on the Supreme Court and secure more expeditious resolution of compact disputes, Federal district courts should be given original jurisdiction over any case or controversy arising under interstate compacts.

Despite its favorable opinion of interstate and Federal-interstate compacts, the Commission does not mean to suggest that river basins in the Nation should be blanketed with them. In many instances far more modest arrangements suffice. Moreover, experimentation with new forms of organization may prove fruitful. The Commission is favorably disposed toward federally chartered interstate regional corporations, patterned after Comsat, Amtrak, and the Public Broadcasting Corporation. Corporations of this type, with Federal membership as may be appropriate, appear competent for such discrete administrative tasks as wastewater treatment, management of interstate aquifers, and in some instances the operation of water supply facilities. Interstate compact commissions might also find occasion to use the corporation to operate specific features of a basin plan.

Procedures

The term "procedures" is used in the broad sense of the manner in which water resource activities are conducted. Included are the planning process and the public's participation therein, and the means of authorizing, budgeting, and appropriating funds for projects.

Planning: The Commission believes that planning for water resource management could be improved at both the Federal and State levels in several basic ways. Federal water planning is now oriented toward construction of water resource projects, an orientation that made sense 50 years ago but that does not relate to today's problems. There is an urgent need to bring together planning for water development with planning for water quality. Too often, water resources planning proceeds independently of and oblivious to planning for such other activities as land use, transportation, industrial development and so on. The interrelationship between land use and water development is apparent, even though planners may ignore it. Flood plain development and flood damage control are correlatives; construction of reservoirs has a significant impact on surrounding land use; zoning and other land use regulation influence not only the demand for water but the production of wastes that may be discharged into water. Several bills were introduced in the 92nd and 93rd Congresses to establish a Federal grant program for land use planning. If legislation of this type is to be enacted the legislation should provide for integrated planning of land and water use. In the meantime the Water Resources Council should make more vigorous efforts to accomplish the planning objectives of the 1965 Water Resources Planning Act, which was intended to coordinate Federal and State planning efforts.

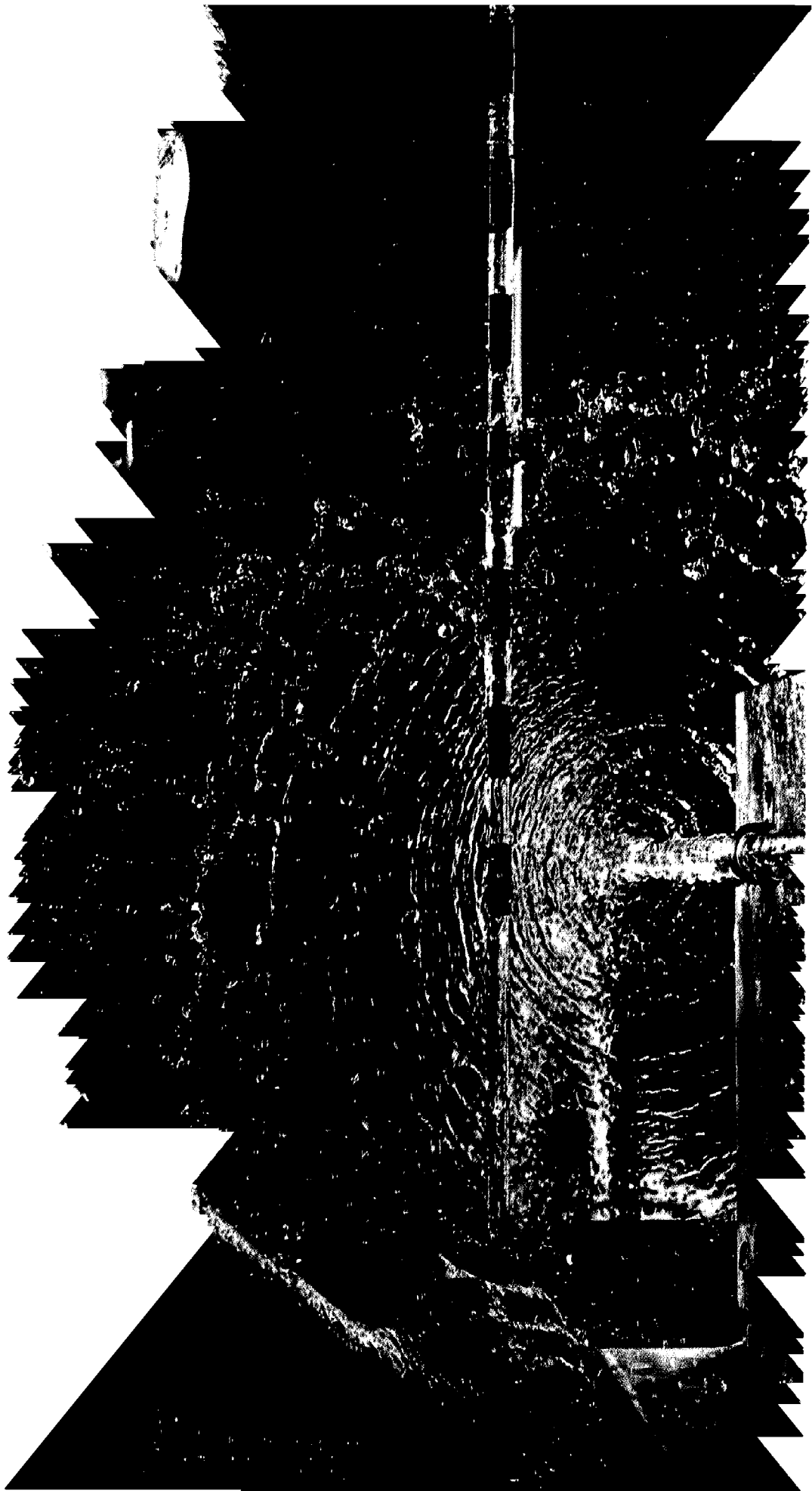
It is also desirable to extend basinwide planning to include tributary and smaller watershed planning. If concrete, detailed land use-water use plans are to be developed, the scope of the planning focus must be altered accordingly. Hence Federal planning grants should be available to municipal, county, and other local or regional agencies rather than to State entities exclusively. Greater emphasis also should be placed on urban participation in interstate

river basin planning. Most basin plans for major rivers have important consequences for urban areas in the basin, but the cities themselves are not usually represented on the river basin commissions. With urban areas participating in the planning process, more careful attention can be paid to water quality components of basin plans, a subject unnaturally divorced from basin planning under present planning procedures.

Another deficiency in water resource planning is insufficient public participation in the process, especially in the early stages. In this connection the "public" means individuals or groups not having decisionmaking responsibility but desiring to influence decisionmakers. Much of the public's concern is with environmental quality but other aspects of water resource development (e.g., economic feasibility) are of interest to the public too. The Commission has no desire to turn water resource planning and development over to town-meeting style decisionmaking, but it does believe that public officials who plan and construct projects or who license private projects should be aware of and concerned about the views of the various segments of the public when proceeding with water resource development.

In enlarging the role of the public in the planning process, consideration must be given to means of obtaining public participation, the setting where public participation should occur, the limitations properly to be placed on public participation, and the problems of excessive and costly delay presented by public participation. Public access to the planning process should begin at the initiation of the planning effort, when the goals and objectives are being identified, and continue through each step of the process until a decision is made. Under this proposal, the public would participate in the consideration of alternatives, the evaluation of benefits and costs, and in each critical stage of project formulation including the review of tentative, revised, and final plans. Each agency should be obliged, at appropriate stages in the planning process, to publish timely, well-publicized information about the opportunities to participate, the alternative courses of action to be considered, the benefits and costs (including environmental benefits and costs), and the course of action the agency favors together with its reasons. All basic data, reports, and other background information should be available to the public and at least one public hearing should be held in the vicinity of the proposed project itself.

To implement this proposal the Commission recommends that the Water Resources Council with the approval of the President draw up regulations setting forth procedures to be followed by Federal water resource agencies to provide opportunities for public participation in the planning process. Congress itself should monitor agency performance in this regard by requiring as a prerequisite to each project authorization a report on the public participation that went into the planning of a proposed project. The report should describe the agency procedures, the amount and timing of public participation, the questions raised by the public and points of view expressed, and the controversial issues, their resolution, and the reasons therefor.



*Water research provides information
leading to better use of water
where the projects may affect the public interests.*

The Commission emphasizes, however, that the role of the participating public is not to decide. One of the proper constraints on public participation is that it does not transfer the authority and duty for making decisions from those entrusted by law with that responsibility to those segments or members of the public who are eager and able to testify. While it is desirable for planning agencies to encourage public participation, it should not diminish their responsibility to perform the duties assigned them by law.

Aside from this constitutional constraint, there is a lingering problem regarding public participation. Even when an agency's rules and efforts are adequate to promote full and fair public participation, there is doubt whether certain segments of the public who may be vitally affected by an agency's decision and who should be heard from, are likely to be represented before the agency at all. Some views are vocal and easy to detect; others, no less important, may be faint, easily overlooked, and diametrically opposed to the views of those participating. Planning agencies should take such constraints into account.

On controversial projects, consensus will not always be possible. That does not mean that some views should be ignored or inadequately explored in the name of efficiency. But lack of consensus should not impede the making of decisions. Once fair and full consideration has been given to competing views, it is important for the planners to reach their conclusions. If agencies are obliged to prepare reports to Congress on their public participation efforts as recommended, the conflicting views will be made known to that body so it may make an informed decision. Consensus should not be a prerequisite for action, nor its absence an excuse for inaction.

These recommended procedures can also be adapted to Federal regulatory agencies which license privately financed projects. The objectives remain the same. The public should be made aware of project proposals and given an opportunity to participate in the early planning stages, should be kept informed as planning progresses, and should have the opportunity to appear in the licensing proceedings. The licensing agency itself should develop information on the effects of each project on various segments of the public.

If affected segments—consumers for example—seem not to be adequately represented in the licensing proceedings, it should appoint a special advocate to represent those groups. To avoid undue delay in licensing proceedings, agencies should encourage informal conferences and hearings and extensive prelicensing planning in which the public participates. Some disputed issues can be identified and, ideally, resolved well in advance of the licensing hearing.

Authorization, Budgeting, and Appropriations: The procedures employed in authorizing, budgeting, and appropriating funds for water resource projects can be improved. Congress should not consider authorizing a project unless the proposal has been developed in cooperation with planning efforts of other affected Federal agencies, river basin commissions, and State and local agencies. After a project is authorized, funding should not depend on sporadic appropriations which force construction to proceed at less than the most efficient rate of construction. Funds should be made available at the time construction is initiated to complete the project under the most economical construction schedule possible. One means to this end was adopted by Congress in the 1972 Water Pollution Control Act Amendments which give the EPA Administrator contract authority to obligate the United States for its share of treatment plant construction costs as they become due, so that once a project is started, completion can be assured on an economical construction schedule.

A large backlog of authorized but not yet started Federal water projects exists. In 1970, the backlog amounted to \$15 billion and it has risen since then. Many of these projects should be reconsidered in the light of changing conditions. For example, most of the Corps projects begun in FY 1972 were authorized in earlier years using an interest rate of 3-1/4 percent to discount future benefits and costs in evaluating project feasibility. Yet the discount rate in effect in FY 1972 had risen to 5-3/8 percent, an increase that might render a number of the projects economically infeasible. The Commission recommends that projects which have been authorized for 10 years or longer and upon which construction has not yet started be deauthorized, and that any project authorized for 5 years or longer be reevaluated under current economic and environmental evaluation standards prior to requesting funds to start construction.

The Commission believes that rigorous economic analysis as well as environmental investigation should precede authorization of water resource projects and programs and should be available to the Congress at the time such proposals are considered for authorization. Benefit-cost analysis is important, but it is not everything nor should it necessarily be controlling. Searching economic analysis provides decisionmakers with information on the consequences of alternative decisions. It does not make those decisions. Important social and political considerations, outside the competence of economic analysis, must also be examined by decisionmakers in deciding

whether or not to authorize water projects and programs.

Water Problems of Metropolitan Areas

Seventy-five percent of the Nation's population now lives in metropolitan communities comprising less than 2 percent of the country's area.

Metropolitan communities present in sharp focus the problems of increased demands for water services, rising costs, and competing claims for developing and conserving the urban environment. The Commission believes that local water managers are going to be asked increasingly to deal with these problems on a functionally integrated basis. The Commission believes that the three basic water utility services, water supply, wastewater collection and treatment, and storm water disposal can in many instances be better planned and managed on a consolidated and areawide basis. In some areas economies of scale may be realized through construction of larger facilities. In other areas protection of waters will require the areawide management of a large number of smaller facilities. There are limits to the economy and efficiency that can be achieved through areawide, functional consolidation, but these will not be fully explored or tested unless there is a capability for consolidated management of water services. The Commission believes that integrated management of water supply, wastewater collection and disposal, and storm water drainage offers opportunities for the better use of water resources and the achievement of urban goals for which water is important.

The relationship between land use and water resource management is particularly important in urban areas. Population distribution and activity allocation are crucial elements of urban water resource planning. The Commission does not believe, however, that the same governmental body should necessarily make the decisions on both land use and water management. Utility managers should not dominate land use decisions, nor should they be prevented from planning future water facilities against the contingency of unexpected changes in land use and population.

The Commission believes that the form of government of metropolitan areas is a matter of State responsibility and properly should vary between States and metropolitan communities in order to meet local conditions. It is unwise for Congress or the President to dictate the form of areawide water services management agencies, or to vest responsibilities in appointive or voluntary bodies that should be handled by elected officials or governments responsible to their electorate.

LAWS

It may seem curious to entitle a section of this Summary "Laws" when many, perhaps most, of the changes suggested will require either change in existing laws or enactment of new ones. The purpose of this section is much narrower: to identify and describe defects in existing legal systems which inhibit the best use of water resources, and to suggest improvements. The focus here, then, is on the legal regimes themselves and the problems they can cause in the management of water resources.

Water Transfers

As noted earlier in the section on economics, allowing the transfer of water rights offers promise of promoting more efficient use of water, particularly in the West, where a large amount of water is held under appropriative water rights. Presently the laws of most States make it difficult, or even impossible, for the owner of an irrigation water right to transfer it to someone who needs water for another purpose at another location, for example to an industrial plant in a nearby city. Yet the water may be far more valuable for industrial than for agricultural use, and the community's economy may benefit far more from the industrial use. Immutably fixing allocations of water in a rapidly changing world is almost guaranteed to make those allocations inconsistent with future needs.

Three kinds of changes in the law would make appropriative water rights easier to transfer. First, each State should establish and maintain accurate and complete records of water rights. The transferability of any kind of property right depends on the existence of such records describing the legal and physical attributes of the property interest. Such a record system does not exist in several Western States. Among other steps which the States should take to improve their water rights records, should be the elimination, after notice and an opportunity to record, of unlisted water rights and the



elimination from the records of paper claims to water use that have been forfeited or abandoned. Federal and Indian water rights should also be described in State water records. Second, the States should simplify the legal procedures for effecting transfers so as to reduce costs, and should allow the purchaser of a water right to enjoy the benefit of the full amount of water he has bought. Third, and most importantly, State and Federal legal restrictions on transferability should be eliminated so that holders of appropriative and contract rights to use water are empowered to make sales of the rights. Some restrictions on transfers must be retained to protect the rights of others; for example, no transfer should adversely affect the water rights of others, and holders of rights who still owe money on contracts with the United States Government should either be required to pay off the debt before any transfer is allowed or, in the alternative, the purchaser should be required to assume liability for the outstanding obligation and to pay interest at market rates. So that Congress will be informed of the potential for reallocation of water to higher uses by voluntary transfers, each proposal for a new water supply project should contain, among other information, a report on the possibility of transfer of water rights as an alternative to construction of the new project.

Permit Statutes

The present riparian law applied in most Midwestern and Eastern States provides an inadequate foundation on which to plan, construct, and operate water resource projects. The Commission recommends principles to guide these States in developing a comprehensive permit system regulating water use. The principles rest on two basic premises:

- (1) The nature of the legal interests in water should be clearly defined and all rights should be recorded. A comprehensive, fully articulated system

*Better permit systems for regulating
water use would aid the planning,
construction, and operating of projects.*

of water rights will promote orderly administration of water uses and will thereby encourage prudent water resource development. Such a system will also facilitate the reallocation of water to more productive uses through the process of voluntary bargaining.

(2) Environmental standards, particularly minimum streamflows, should be established at the outset to protect both the environment and the water users.

The essential elements of the system are its application to all uses of water, both surface and ground water (existing uses would be entitled to permits as a matter of right upon timely application); the abolition of restrictions on locations at which water may be used; a detailed record system for permits which describe all significant characteristics of the right, such as quantity of use, place of use and return flow; free transferability of permits subject to the rule that a transfer cannot injure the water rights of others; the establishment of environmental standards; and the allocation of water in periods of shortage in accordance with predetermined, nondiscretionary rules upon which investment decisions can be made with security.

Ground Water

In many States, ground water law, like riparian surface water law, is inadequate to allocate the resource among competing users and is unresponsive to the problem of excessive use. The first defect results from the vagueness of the rules of allocation ("reasonable use") and the second from the failure of the legal system to perceive that ground water is often a common-pool resource in which there is little incentive to save an exhaustible supply for use tomorrow. Any user who seeks to save is subject to having his savings captured by another pumper from the same aquifer. It is the Commission's recommendation that a new legal system to govern ground water should be instituted in States where better management of ground water is needed.

Laws should be enacted authorizing the establishment of water management agencies with power to manage surface and ground water supplies conjunctively, to coordinate surface and ground water withdrawals, to



control the rate at which an aquifer is depleted (through pump charges or quotas on withdrawals), to replenish aquifers by artificial recharge techniques, and to protect aquifers from pollution.

Apart from pollution control guidelines comparable to those which apply to surface water, the Commission does not believe that Federal regulation of ground water is desirable, but it does hold that the adequacy of the ground water management system is relevant to the need for Federal projects to supply supplementary water to overdrawn basins, and recommends that a description and evaluation of such ground water management systems be incorporated into reports to Congress on proposed projects for supplying additional water to such basins.

Recognition of Social Values in Water

The water law systems of most of the States, both in the East and the West, are deficient in that they fail to give appropriate recognition to social values of water. These values arise primarily from such instream uses as fish and wildlife propagation, recreation, and esthetics. The appropriation law of the Western States generally requires diversion of water from the stream or lake and its application to beneficial use in order for a water right to be created. Instream values are thus heavily discounted; water has been diverted from streams to such an extent that instream values which should have been protected frequently have been impaired, and sometimes destroyed. The riparian system of the Eastern States does give some protection to instream values principally at the behest of those persons who own land along the stream or lake; thus, the law has operated primarily in favor of private landowners with no public rights of either access or use. In both appropriation and riparian jurisdictions the rights of the public in water bodies are receiving increased recognition under the ancient doctrine of "the public trust." The Commission recommends that these rights be clarified and codified as part of general State legislation governing public use of water bodies. The legislation also should provide for the acquisition by negotiated purchase or eminent domain of easements to permit public access to selected water bodies not subject to the public trust, and for the protection of private property owners from damage caused by improper or illegal public use. In addition, where the action can be taken without impairing vested rights, State officials should be authorized to set minimum streamflows and lake levels to protect *in situ* values.

Federal-State Jurisdiction Over Water

Both levels of sovereignty in the United States have legal regimes applicable to water. The basic property system in water is established in State law, but superimposed on and sometimes cutting across the State's legal systems are Federal laws applicable to water. This dual system of water law causes

conflicts which are not unexpected in a federal system such as that of the United States. Nevertheless, to the extent possible, it seems worthwhile to attempt to ease the friction and reduce the heat without the sacrifice of vital interests.

The Commission has sought solutions in three problem areas: (1) coordination of Federal water activities with State water rights administration; (2) immunity of the United States from suit in certain kinds of water litigation; and (3) noncompensability of certain privately owned water rights when taken by the United States. Indian water rights problems were also examined by the Commission and separate recommendations concerning them are being made.

To clarify the law and promote harmonious relationships in the use and administration of water between the Federal Government on the one hand and the States and users claiming under State law on the other, the Commission recommends the enactment of a National Water Rights Procedures Act. The proposed Act is intended to deal with each of the three problem areas identified by the Commission.

The Act would confirm the legality of all existing Federal water uses and direct that they be placed on record in accordance with State procedures for adjudicating and recording other water rights. To assist in establishing a complete water rights record in each State, the immunity of the United States from lawsuits to adjudicate conflicts in water claims would be fully removed. So far as water rights adjudications are concerned, the United States would be treated like any other water user, except, of course, that Federal law would govern the measure of its right to the use of water.

As to future water uses by the United States, again it should be free to use water for whatever constitutional purposes Congress may authorize. The Act would require recording of those uses with the States and would require employment of eminent domain to acquire water rights in advance of constructing a project if no unappropriated or other unused water was available to supply the project. If any owner of an existing water right believed himself to be unlawfully injured by actions of Federal officers in making use of water, the aggrieved person could sue the United States in the Federal courts and upon establishing his case obtain appropriate legal relief.

Under the Commission's proposed Act, the United States, when using water in the future, could not impair existing water rights valid under State law by claiming the benefit of the "navigation servitude" or the "reserved rights doctrine." These two legal doctrines allow the United States to take and make use of privately held water rights without the payment of compensation—a power the United States does not have over any other species of private property. Under the proposed Act, the United States would be free to acquire any existing water rights it chooses, but must compensate the owners for the taking.

Indian Water Rights

The Commission has treated Indian water rights separately from Federal water rights because the Federal Government is not the outright owner of those rights but is a trustee with fiduciary duties to the Indian beneficiaries. It is desirable that existing Indian water uses be recorded with State officials in order that a single, comprehensive register of uses be maintained. Existing decrees and those granted in the future should also be filed in the State records office to give notice of potential demands on the supply. Such recording would not subject Indian water rights to State laws and regulations inconsistent with the nature of the rights as determined by Federal law. In order to allow quantification of Indian water rights and have them evidenced by judicial decree, the defense of sovereign immunity to suit must be removed. The Commission therefore recommends passage of legislation allowing suits by or against the United States and Indian tribes to adjudicate Indian water rights. The proposed legislation would also remove uncertainty in existing law by expressly allowing Indian tribes to initiate water rights litigation.

Jurisdiction over all suits involving adjudication of Indian water rights should be in Federal District Court only, except where the Constitution gives concurrent, original jurisdiction to the Supreme Court. In such suits, the Indian tribes would be given the choice of representing themselves or being represented by the United States. The States would also be given an opportunity to intervene and to represent *parens patriae* the affected water users in the State, except in instances of conflict of interest. The law applicable to Indian water rights adjudications is Federal law. Federal courts are the appropriate tribunal to determine the origin and extent of such rights.

Although Indian water rights represent some of the earliest rights on Western rivers, Indian water resource development is far behind non-Indian development. For the protection of both Indians and non-Indians, no new federally assisted non-Indian water project should be authorized or constructed until an adjudication is made of Indian water rights which if exercised would adversely affect the new project. The Commission recommends that the Secretary of the Interior, in cooperation with Indian tribes, conduct extensive studies of the natural resources available on Indian reservations, including water resources, with the object of quantifying the Indian water rights and planning their economic use. The Commission also recommends that the United States offer financial assistance to tribes wishing to develop unused water, but cautions against precipitate decisions to construct uneconomic projects merely for the purpose of making use of the water right.

In the case of over-appropriated streams in which an Indian tribe has rights superior to non-Indian appropriators, the tribe should be empowered, at its sole discretion, to lease its water and water rights to the United States under legislation obligating the United States to lease from the tribe any interest in

water the tribe offers at the fair market value of the leased interest. This latter obligation would do much to remove the incentive of tribes to embark upon unwise water projects and would give them means to develop other resources that might in some instances be more profitably developed than water resources.

Because both public and private investment in water resource development on streams running through or bordering Indian reservations has been so much greater for non-Indians than for Indians, and yet Indian water rights are often superior to non-Indian rights, the Nation faces an almost intractable problem of conflict. Although Indian development in the future will often have a superior legal claim to a water supply already put to a non-Indian use, the latter uses have been encouraged over the years by the Federal Government and in many instances financed by it. Rather than requiring Indians to forego the use of water already committed to other projects and compensating them for the loss, the Commission recommends that the Federal Government either develop an alternate source of supply or compensate the non-Indian water users who are injured by later Indian water development. Such alternate supply or compensation should not extend to values created by Federal subsidies or to non-Indian users or their predecessors who had actual notice of the conflicting Indian claims at the time of development; and in no event should alternate supply or compensation extend to non-Indian projects initiated after the decision in *Arizona v. California* (June 3, 1963), when the full reach of Indian water rights first became clear. The cost of an alternate supply or of compensation should be a national obligation like the cost of fulfilling the Mexican Water Treaty, and should not be chargeable to any Indian water project.

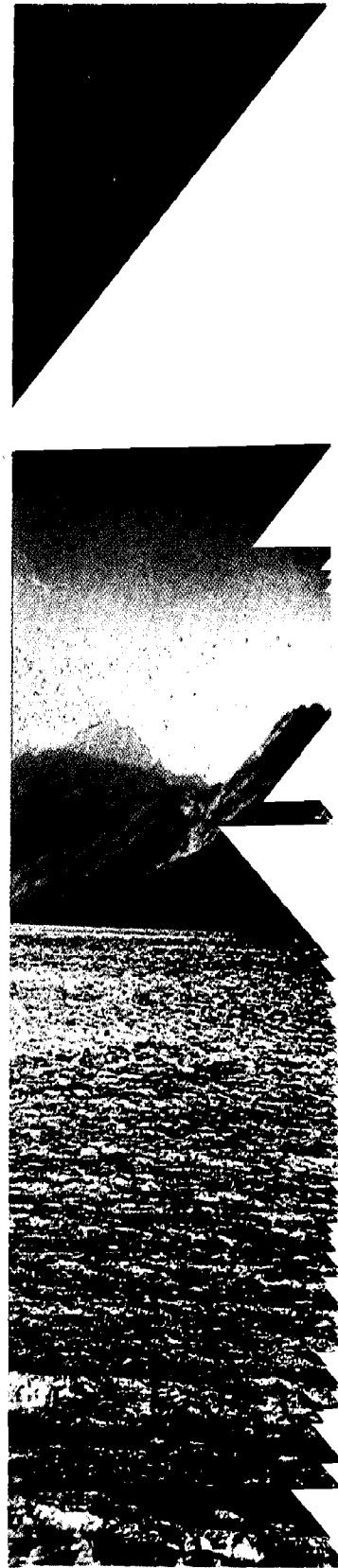
CONCLUSION

This summary has sought to condense the main report by presenting the key recommendations of the Commission and the major reasons behind them. The essence of the Commission's approach to water can perhaps be best described as a rejection of the philosophy that "water is different." Water, as the Commission views it, is one of many resources that must be managed prudently for the national good. Prudent management requires the pursuit of sound economic policies to increase national wealth and of wise environmental policies which promote the health and happiness of the people and protect the life supporting ecological systems of the earth. Institutions and procedures must be adequate to the task of identifying policy questions, of analyzing the issues on an information base broad enough to predict results, and then of making decisions. Finally, the legal system must provide the means of implementing policy decisions while protecting the rights of individuals. In the hope of contributing to better understanding of the Nation's water problems and how to deal with them, the Commission's report was prepared and is submitted to the Congress, the President, and the Nation.

Part 2

CONCLUSIONS AND RECOMMENDATIONS

From the FINAL REPORT of the
NATIONAL WATER COMMISSION





More than 200 specific recommendations for national water policy are offered in the final report of the National Water Commission. All of these recommendations and the Commission's pertinent conclusions are reproduced in Part II.

The 17-chapter final report, providing a comprehensive survey of how and why the Commission reached these conclusions and recommendations, will fully amplify this brief summary material.

CHAPTER 1. FORECASTING FUTURE DEMANDS FOR WATER

CONCLUSIONS

Water use is responsive to many variables in policy and technology as well as to rates of growth in the population and the economy which cannot be forecast with any assurance. Thus, any projection of the future need for water based only on past trends is quite likely to be wrong. What must be done is to study a variety of alternative futures in which the factors affecting water use are explicitly considered. The alternative futures discussed in this chapter indicate the wide range of policy choices, tradeoffs, and flexibility in water use that are available. The Commission believes that all policy planning activities should give consideration to a wide range of possible choices so that there is assurance that the selected course of action will, regardless of any future which can reasonably develop, be a sound decision for the Nation. In the words of René Dubos, "trend is not destiny."

CHAPTER 2. WATER AND THE NATURAL ENVIRONMENT

CONCLUSIONS ON WATER DEVELOPMENT PROJECTS

Potential water resources programs and projects need to be approached carefully and analyzed comprehensively so they do not produce unexpected and environmentally unacceptable results.

Elsewhere, this report makes a number of recommendations directed toward the better planning and evaluation of such programs and projects. These recommendations, designed to further sound projects and to eliminate unsound ones, are applicable to environmental considerations as well as to economic ones. Since the rationale for these recommendations is set out more fully in other chapters of this report, the discussion here is limited to ways in which these recommendations apply to environmental considerations.

1. Develop an adequate data base. The Commission has recommended an extensive, continuous program for collecting and organizing data on the condition of the Nation's waters. Too little is known about their present



characteristics and quality and additional information is needed to assist intelligent judgment about the levels of quality which should be sought and the measures needed to achieve them.

However, if the Nation is to have environmentally sound land and water development, it may not rely upon water quality data alone, important though that is. A broader data base is needed. The ecological processes and environmental attributes of potentially affected areas should be studied; wherever practicable, these studies should include the geology, soils, fisheries, climate, vegetation, historical and archeological resources, land uses, esthetics, and other relevant factors.

2. Conduct further research into the environmental impacts of water resource development. The Commission has identified this as one of the Nation's primary water research needs. Too little is known about the environmental impacts, good and bad, of water projects. In particular, while our knowledge about ecological processes is expanding and becoming more sophisticated, there is a need for further work to improve the prediction of ecological effects of proposed water projects and of possible modifications or alternatives.



3. Utilize planning techniques which are sensitive to ecological processes and environmental values. Some imaginative techniques exist. The work of the Potomac Planning Task Force, assembled by The American Institute of Architects, provides an example. The Task Force recommended an "environmental approach," starting with "the recognition that nature contains intrinsic resources which may be utilized to our benefit but may not be overtaxed except at a cost." They suggested gathering appropriate data on such natural resources as terrain, water, minerals, and vegetation; by analyzing this data, unique or scarce components of the landscape could be identified, as well as the most appropriate areas for different types of land and water use. The Task Force applied this approach to five major physiographic regions within the Potomac Basin and to the Washington metropolitan area. Innovative approaches such as this, conducted with realistic consideration for the resulting plans' economic and political acceptability, offer promise.

A later section of this report deals with the role of the public in water resources planning. While public participation serves to develop public preferences broadly, including economic preferences, one important function is to involve members of the public from the inception of planning in order to identify what they believe are the important elements of environmental quality, to broaden and deepen the planning agency's examination of environmental effects, to suggest alternatives which the agency might not consider under traditional approaches, and to educate both the public and the agency.

In some situations it is helpful and practical to construct and operate a model to simulate the effects which different actions will produce within the system modeled. For example, in Chapter 11, Section E, the Commission recommends increased Federal support for water quality models for the Great Lakes.

4. Develop rigorously and present as clearly as practicable the environmental impacts associated with a proposed water resources project and the available alternatives. The National Environmental Policy Act (NEPA) requires Federal agencies to describe the environmental impacts of major proposed actions, including those which cannot be avoided should the proposal be implemented, and to explore and describe alternatives to the proposed action. The Commission believes that NEPA, if properly applied, provides an important tool for planning and evaluating water resources programs and projects. However, too often an environmental impact statement submitted under NEPA reads like a justification for a particular project rather than a rigorous exploration of impacts and alternatives. Impact statements, and the analysis which they reflect, should help shape agency decisions, not simply justify them.

NEPA, as interpreted by the courts, requires a "rather finely tuned and 'systematic' balancing analysis in each instance"—an assessment of the relative

weight of environmental, economic, and other costs and benefits. Accordingly, it is appropriate for development agencies to discuss the range of benefits which a proposed project may produce. However, an environmental impact statement which emphasizes the positive and talks primarily about the "environmental" benefits which a project may bring by providing additional water supply, flood protection, and water recreation, misses an important point. The environmental impact statement is supposed to be a tool for assessing and evaluating the impacts which a proposed project will have upon the natural environment, so that these may be considered along with other factors. In order to serve this purpose, an environmental impact statement should describe in detail the nature and magnitude of the environmental impacts which a project and its alternatives may produce, good and bad, and the possible combined or synergistic effects with other existing or proposed developments and land uses. Beyond this, the Commission believes that an environmental impact statement is particularly helpful when it identifies and discusses measures which can be taken to mitigate the adverse environmental impacts of a proposed action, including measures which might be taken by another government agency.

5. Reach a decision. Even improved programs of data collection, research, planning, and analysis should not be expected always to produce definitive information on every possible environmental impact of a proposed project and its alternatives.

Some predicted consequences, good or bad, may remain as unproved possibilities, incapable of being established either as future fact or of being dismissed with certainty. Planners and decisionmakers must meet their responsibilities fully and fairly to evaluate the information which is available or reasonably attainable, but when they have done so, the time comes for judgment of probabilities and decision on the best information available.

6. Monitor environmental consequences. Once projects are completed, the environmental impacts should be monitored to obtain information which would provide a better basis for future decisions to protect the environment when water projects are undertaken.

CONCLUSIONS ON COASTAL ZONES

One of the major premises of this report is that water resources and water quality planning must be integrated with land use planning. This is especially true in the coastal zone and in upstream areas where land use affects the estuaries. Decisions about where, whether, and how to dredge and fill, develop real estate, preserve natural systems, locate industries, and dispose of wastes determine to a large extent the possible uses and the environmental health of the waters and associated shorelands of the coastal zone. For this reason, planning for the coastal zones should be handled in coordination with general land use and water resources planning, as discussed in Chapter 10.

RECOMMENDATION

- 2-1. Water resources development plans and projects should include measures to protect the estuarine and coastal waters and marshlands. The cost of measures required for such protection should be included in the joint costs of proposed projects and borne by the beneficiaries of the projects, except where Federal policy authorizes nonreimbursable allocations to be borne by the Federal Government for benefits of widespread or national scope that cannot be traced to particular beneficiaries.

CONCLUSIONS ON CHANNELIZATION

There can be no doubt that most channelization projects produce both beneficial and detrimental effects, just as do all other measures used in developing water resources. And as for all other types of water projects, the question to be answered is this: Are the benefits to the Nation sufficient to outweigh the total cost to the Nation, including the cost of the detrimental effects previously described? Channelization projects are similar to all other water projects in still another respect: For some of them the benefits exceed the costs and for others the reverse is true.

The evidence placed before the Commission makes it impossible to avoid the conclusion that in many cases insufficient weight has been given to the detrimental consequences of channelization, and particularly to losses not readily expressible in monetary terms. There appears to be a tendency fully to evaluate all benefits that would result from channelization projects but to underestimate, or even to ignore, some operation and maintenance expenses and damages resulting from lowering of ground water tables, destruction of fish and wildlife habitat, increasing downstream sedimentation and flood damages, and loss of esthetic values. The work accomplished during the past few years by the Water Resources Council in its development of principles, standard, and procedures for the evaluation of water projects has made it abundantly clear that in the past such evaluations have generally failed to consider all of the consequences of carrying out such projects. It has also made it clear that there are many detrimental effects that must be added to the cost of such projects if a valid benefit to cost comparison is to be made. The Commission hopes that as the procedures being developed by the Council are perfected, and all Federal agencies are required to comply with them, the intensity of the channelization controversy will gradually wane.

The Commission also believes that as another means of insuring that future channelization projects are truly in the national interest, the direct beneficiaries thereof should be required to assume any costs properly allocable to the purpose of increasing the value of private lands. This would serve to dampen the desire of landowners to make more intensive use of wetlands and of lands subject to frequent inundation.



The Commission urges, in Section E of Chapter 5 of this report, that the use of flood plain lands be regulated by the States or appropriate local governmental entities. If the recommendations of that section are implemented, the need for future channel improvement projects, particularly in urban areas, would be substantially reduced.

RECOMMENDATIONS

- 2-2. All agencies responsible for planning and carrying out channelization projects should broaden and otherwise improve their evaluation procedures, making a special effort to reflect in the cost estimates damages caused by increased downstream flooding and sedimentation, lowering of ground water levels, and loss of fish and wildlife habitat and esthetic values. The full cost of continuing maintenance should also be reflected.
- 2-3. All future proposals for channelization projects should be required to indicate the part of the cost thereof that is properly allocable to the purpose of increasing the value of lands in private ownership, and that no such project should be approved unless and until an appropriate non-Federal entity has agreed to assume that part of the project cost.
- 2-4. In considering requests for funds to carry out previously authorized channelization plans, the Appropriations Committees of the Congress should require the submission, by both the agency that would be responsible for the use of these funds and the Council on Environmental Quality, of statements on the probable effects of the proposed undertaking on downstream flood and sedimentation problems, on ground water levels, on fish and wildlife habitat, and on esthetic and other noneconomic values and these Committees should provide for the funding of only those projects for which, in their opinion, the benefits are sufficient to justify both the monetary and nonmonetary costs to the Nation.

CHAPTER 3. WATER AND THE ECONOMY

CONCLUSIONS ON WATER VALUE

The comparison of water values in alternative uses will become increasingly important in the years ahead, as growing demands compete for limited natural supplies and values in use increase. The opportunities for net gains by better allocations will be much greater. Not only will efficiency in design of facilities be important, but also efficiency in allocation of the water itself. Economic values provide the best general indication of the basic worth of water if appropriate attention is given to protection of environmental values. Pricing policies, discussed in Chapter 7, can be most helpful in improving the

allocation of water. A systems framework is important, as is appropriate measurement of values in use not only in terms of quantity but also quality and timing and location of return flows.

The Commission's conclusions can be summarized as follows:

1. In river basins where present and projected demands for water indicate some element of competition, the values of water in alternative uses (including environmental values) should be estimated as a part of planning studies and the resulting development plan should seek to maximize these values.
2. Water resources should be analyzed as individual hydrologic systems taking into account the value of the various aspects of water uses including their impact on quantity, quality, timing, and location. Proposed diversions and instream uses should be analyzed in these same terms and evaluated on the basis of their effects on subsequent uses within the system.
3. Values of water for fish, wildlife, and esthetics cannot now be satisfactorily determined directly by economic evaluation. However, they can be indirectly determined by considering the economic values of uses in the hydrologic system with and without these uses. These "with and without" values should be determined so that informed judgments can be made on balancing of all uses within the hydrologic system. The value of the uses preserved must be judged to equal or exceed the value of alternative uses foregone.

CONCLUSIONS ON REGIONAL DEVELOPMENT

1. While water resources projects have had very significant impacts on regional economic development and population distribution in the past, they are not usually the most efficient way to accomplish these objectives and their importance is diminishing.
2. Under certain conditions, water development may be helpful as one of several ingredients necessary to encourage regional economic development and population growth, or to preserve existing development. However, water developments differ widely in the effects they induce. Congress, in making judgments as to whether water developments should be used to aid regional growth, should require evaluations of certain critical growth factors in order to enhance the effectiveness of developments and reduce offsetting losses in other regions. These factors include: market demands, availability of substitutes for water services, competitive advantage of the region, and the potential for capitalizing on growth opportunities.
3. Federal water programs can be easily adjusted to support whatever population distribution policy the Nation adopts. However, water programs are not, in and of themselves, adequate to effectuate a national policy concerning where people will live. Water programs should continue to accommodate future population growth and economic well-being by responding to the pattern of interregional population distribution. In some



Evaluation of alternative uses of water should be a major part of water resource project planning.



instances water programs may influence desired population distribution provided other controlling conditions are favorable. Where Congress has determined that the growth of a particular area should be promoted in the national interest such programs may be used if they provide the most efficient way to achieve that growth.

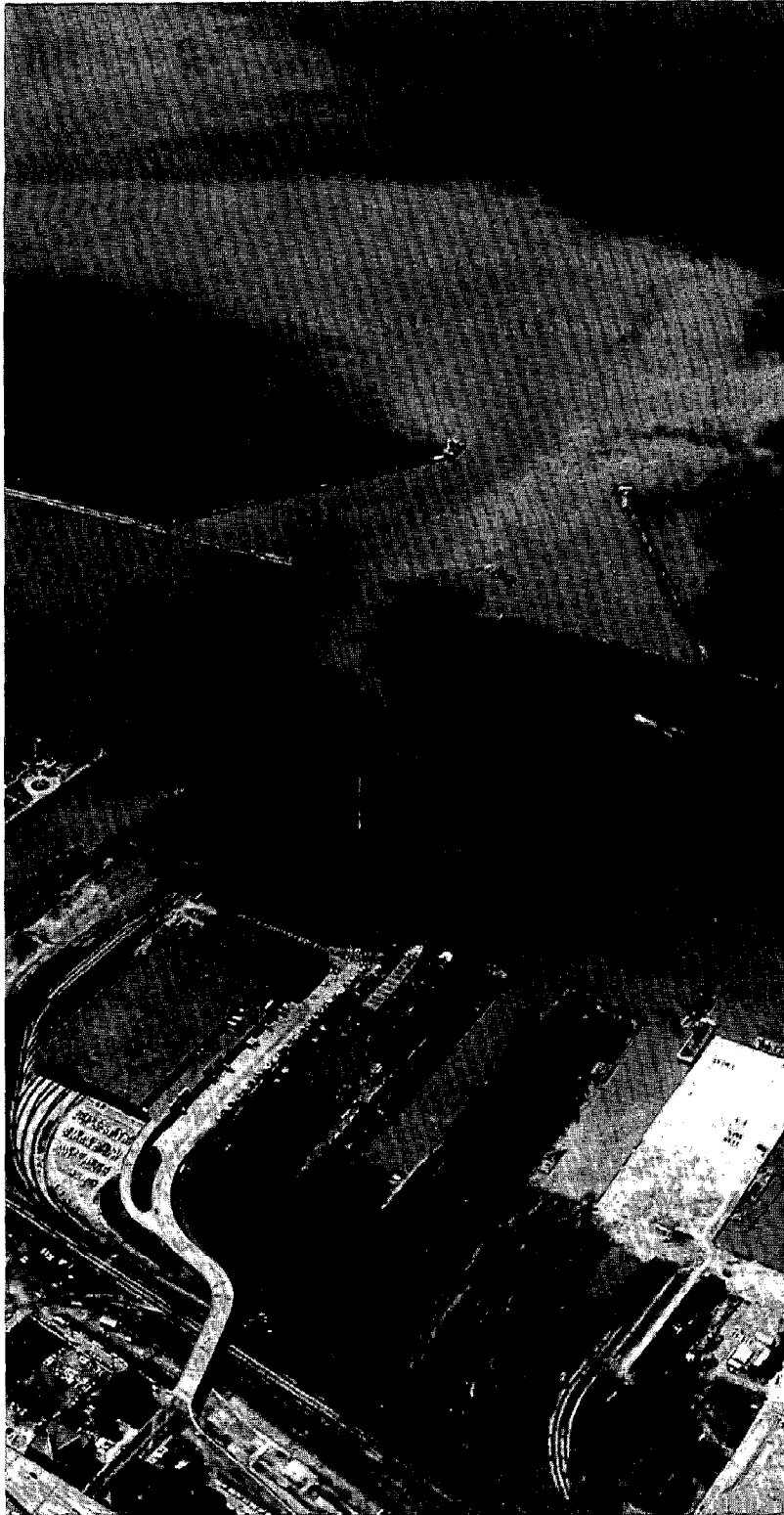
CHAPTER 4. WATER POLLUTION CONTROL

RECOMMENDATIONS

- 4-1. The Nation's water pollution control policy should be based on the principles that (1) water is polluted when its quality has been altered by the activities of man to such a degree that reasonable present and prospective uses as designated by public authorities are impaired, and that (2) the objective of pollution control should be to protect the designated uses. The 1972 Act should be revised to restore these policies.
- 4-2. Receiving water standards should be established under the principles stated in 4-1, above, for all State waters, including ground waters. Standards should be sufficiently high to protect all existing uses and all reasonably foreseeable future uses, but should also take into account the economic, social, and environmental costs of achieving them.
- 4-3. A national water pollution abatement program sufficient to achieve the approved water quality standards should be accomplished in 10 years. To achieve this goal Federal construction grants at the percentages prescribed in the 1972 Act should be authorized and allocated to qualifying State and local governments at levels which will assure the completion of all necessary projects and the reimbursement for projects which have not received the full amount of aid under prior programs. The Federal grant program should terminate upon the achievement of the national cleanup goal.
- 4-4. Increased research and development should be undertaken: (1) on alternative methods for waste treatment and disposal, with particular attention to methods which make productive use of the nutrient value of wastes, including further demonstration projects to test the utility of land disposal and aquaculture techniques under varying local conditions and different composition of wastes; (2) on the impacts which alternative water pollution abatement processes may have upon other environmental elements such as air and land; and (3) on the development and improvement of techniques for controlling nonpoint pollution sources.
- 4-5. The 1972 Act should be amended to give the EPA Administrator the flexibility to approve grants for alternatives to either conventional

treatment processes or uniform treatment requirements when such alternatives can reasonably be expected to produce equal or better receiving water quality for the expenditure of a lesser amount of Federal funds.

- 4-6. Federal grants to municipalities during the national cleanup period should be made contingent upon adoption by the municipality of schedules of service charges which will provide, after the grant program is terminated, for full recovery of capital and operating costs of the system, exclusive of those costs which will have been financed with Federal or State grants. Charges should be based on the costs which users impose on the system.
- 4-7. The following steps should be taken under the 1972 Act.
 - a. Accomplishment of an expanded program of planning of regional water quality management for the entire country, coordinated with planning under the Water Resources Planning Act.
 - b. Appropriation of necessary funds for grants to States and interstate agencies of 50 percent of the cost of carrying out this planning.
 - c. Periodic national program evaluations to measure progress in water quality improvement, made in conjunction with the periodic assessments of water supplies by the Water Resources Council and the annual reports of the Council on Environmental Quality.
- 4-8. Regional or metropolitan waste management agencies organized under State authorization should be charged with planning and implementing programs for collection and disposal of waterborne wastes. Such agencies should provide for local or State decision-making with regard to techniques for meeting standards, financing the program, and enforcement. The 1972 Act should be amended to delete requirements for Federal control over the organizational form of such agencies, leaving the form of local government up to the States.
- 4-9. Water quality standards should be implemented through a national waste discharge permit system, administered by State authorities under Federal guidelines. The 1972 Act should be implemented by EPA in a manner which will maximize the opportunity for early State assumption of responsibility for the issuance and enforcement of permits. Discharge limitations should be based on local receiving water standards, taking into account the self-purifying capacity of natural water bodies. Such capacity should be allocated, with appropriate safety factors, to existing discharges, conservation and recreation reserves, and a reserve for future discharges in accordance with applicable land use and comprehensive water quality plans.



Water quality standards should be implemented through Federal guidelines on a national water discharge permit system administered by the States.

- 4-10. Permits issued under the national permit system should place dischargers in compliance with Section 13 of the Refuse Act.
- 4-11. The States should have primary responsibility for information collection systems, but the Federal Government should have responsibility for developing, in cooperation with the States, both a national stream surveillance system and a uniform data collection, storage, and retrieval program, under the direction of the U.S. Geological Survey.
- 4-12. Except in the event of default in performance as determined through preestablished procedures, States should have primary responsibility for definition and implementation of water quality standards, including the time frame for implementation, and for regulatory and enforcement actions, including the issuance and administration of the permit system. Federal agencies should avoid taking actions which interfere with or supersede legitimate State and local functions in the implementation of the Nation's pollution control program.
- 4-13. The Congress should obtain greatly improved information on the cost effectiveness of Federal water quality programs, looking toward providing assurance as to: (1) costs to the Nation of achieving alternative levels of water quality improvement, (2) beneficial effects to be realized through the programs, (3) probability of proposed programs achieving objectives, and (4) priorities for the abatement of pollution from alternative sources in various regional and local areas.
- 4-14. Present education and training programs should be continued and expanded as needed to meet manpower requirements. However, the level and composition of education and training programs should be justified on the basis of periodic surveys of the manpower needs for water pollution control programs of State and local governments.
- 4-15. Study of alternative methods of disposing of residues should continue, so as to provide data to guide future decisions. This should include a comprehensive survey by the National Oceanic and Atmospheric Administration to determine the extent of pollution throughout the coastal zone and adjacent oceanic areas and the Great Lakes.
- 4-16. Estuarine and lacustrine research programs of the Federal Government and of State agencies should seek improved bases for the establishment of water quality standards for estuarine and coastal waters and for the Great Lakes.

CHAPTER 5. IMPROVING WATER RELATED PROGRAMS

Section B. The Inland Waterway Program

RECOMMENDATIONS

- 5-1. Any report proposing a Federal inland waterway project should provide an estimate of the true economic cost and benefit to the Nation of providing the contemplated transportation service, and a comparison thereof with the true economic cost of providing this service by the least-cost alternative means. This should be in addition to the estimate presently required by Section 7 of the Department of Transportation Act of 1966.
- 5-2. Legislation should be enacted to require non-Federal interests to bear an appropriate share of the cost of Federal inland waterway projects. Such legislation should require: (a) that carriers and pleasure craft using inland waterways be required to pay user charges such that the total collections on all Federal waterways would be sufficient to cover Federal expenditures for operation and maintenance of the entire system; (b) that within the bounds of administrative practicability the user charges should consist of a uniform tax on all fuels used by vessels operating on the inland waterways, plus lockage charges at rates sufficient to repay the cost of operating and maintaining the locks within integral segments of the total waterway system; (c) that charges be imposed gradually over a 10-year period and increased progressively so that by the end of that period they will be sufficient to recover annually the entire cost of operating and maintaining the Federal inland waterway system; and (d) that as a condition for Federal construction of future inland waterway projects responsible federally chartered or non-Federal entities be required to enter into agreements to repay the construction costs, including interest, over a specified period of years unless the Congress determines that a particular waterway will result in national defense benefits sufficient to justify assumption of a part of the cost by the Federal Government.
- 5-3. Any legislation requiring the payment of waterway user charges should also authorize and direct the Federal transportation regulatory agencies to regulate rates for all competing modes of transportation in such a way as to encourage the use of the waterways for any traffic that could move by that mode at the least economic cost to the Nation.
- 5-4. The Department of Transportation should broaden and intensify its efforts to improve national transportation policy. It should develop a plan for such administrative and legislative actions as may be required to bring into being an integrated national transportation

system in which all modes of transportation, including inland waterways, are utilized in such a way as to reduce to a practical minimum the cost to the Nation of meeting the demands for transportation. To prepare the way for the development of such an integrated and efficient national transportation system, the Department of Transportation should develop and submit to the President and the Congress recommendations designed to provide the data base that will be needed to achieve the objective of this recommendation.

Section C. Food and Fiber Programs: Increasing Agricultural Production Through Water Resource Development

CONCLUSIONS

Land reclamation measures such as irrigation and drainage of new land, protection of existing and potential cropland from floods, and provision of supplemental irrigation water for existing croplands have added to the excess productive capacity of U.S. agriculture and have thereby contributed to the high costs of crop price support and land retirement programs. If the assumptions used in the Iowa State University studies are reasonable, and we believe that they are, there appears to be adequate productive capacity in the Nation's agriculture to meet food and fiber demand under various alternative futures at least until the year 2000. In such case there would be no need in the next 30 years to continue federally subsidized water resource development programs to increase the agricultural land base of the country, but where the Federal Government has executed contracts to complete water projects already begun, such projects should of course be completed.

Even if none of the alternative futures assumed in the Iowa State University studies, adequately project the actual supply and demand for food and fiber for the year 2000, there is still no justification for subsidizing reclamation projects. If, for example, export demand for food and fiber greatly exceeds the amount contemplated in any of the alternative futures considered, that demand should nevertheless be satisfied in the most efficient way. Efficiency in agriculture, as in many other sectors of the economy, is more often than not distorted by subsidies. The discipline of the marketplace should be relied upon to insure that, consistent with environmental constraints, food is produced in the least-cost way. That may or may not entail more land under irrigation than at present. But the decision should not be distorted by the influence of subsidies.

If the demand for such high-value, specialty crops as fruits, nuts, and vegetables should increase so as to require the use of additional land, the demand can be met by the private sector in a number of ways without Federal subsidy, for example, by shifting land presently in use for production of low-value crops to production of high-value crops.

Even if the United States should embark upon large-scale aid programs to supply food to the rest of the world, the reclamation of farm lands should pay its own way. Any subsidies in the price of exported food found advisable for reasons of foreign or domestic policy should be straightforward (e.g., direct appropriations to the Department of State to purchase food in the open market) so that whatever food is produced is obtained in the most efficient least-cost way.

The adoption of the Commission's recommendations on cost-sharing (Chapter 15), which would require identifiable beneficiaries or owners of benefited property to repay their respective shares of the full costs of irrigation, drainage, and flood control projects, and the recommendations on project evaluation as a basis for decisionmaking (Chapter 10), which would require that consideration be given to both the positive and negative effects of proposed projects on all regions, would serve to limit public support for those projects and programs which would not contribute significantly to the development of viable economies and qualify environments in the Nation's water resource regions.

The Commission is aware that its recommendations would lead to a reduction in new starts on projects by the Federal water agencies. The future role of these agencies is considered in Chapter 11, Section C.

RECOMMENDATION

- 5-5. Legislation should be enacted to require full repayment of costs of Federal water resource development projects that result in increases in production of food and fiber in accordance with the principles set forth in Chapter 15 of this report.

Subsidized reclamation of farm lands sometimes results in crop surpluses.



Section D. Acreage Limitations and Subsidies in Reclamation Programs

CONCLUSIONS

Future Reclamation Programs

The Commission concludes that subsidization of new irrigation projects is not justified on either social or economic grounds. Reclamation farms differ little from nonreclamation farms, but federally subsidized irrigation does increase farm surpluses, increasing the costs of price-support programs and disadvantaging farmers in other parts of the country. Direct beneficiaries of Federal irrigation developments should, therefore, be compelled to pay in full the costs of projects allocated to irrigation in conformity to the general principle of full-cost repayment proposed for other water development projects elsewhere in this report.

If full repayment of irrigation costs is required of benefited irrigators, no reason is perceived for subjecting them to an acreage limitation. No subsidy has been conferred and no windfall gains will be obtained. In fact, there appear to be good reasons not to impose a limitation. As a general proposition, restraints on citizen behavior should be avoided unless good cause is shown for limiting freedom of choice. Moreover, arbitrary rules restricting economic choice are likely to cause misallocation of resources. The average size of the American farm has been on the increase as economies of scale are achieved with improved technology. An acreage limitation runs counter to this trend and could produce one of two undesirable consequences: (1) Economic pressures would be such that evasion of the law would occur or (2) the law would be enforced despite the economic pressures but at the cost of a less efficient irrigation industry. Accordingly, the Commission concludes that the 160-acre limitation should be eliminated in future reclamation programs if direct beneficiaries pay in full the costs of projects allocated to irrigation.

Existing Reclamation Programs

It is the Commission's opinion that any lifting of the acreage limitation on existing reclamation projects should be accompanied by an increase in the price of reclamation water reflecting more accurately the real cost of obtaining the water and delivering it to the farmer.

RECOMMENDATIONS

- 5-6. Subsidization of new irrigation projects should be discontinued. Direct beneficiaries of Federal irrigation developments should pay in full the costs of new projects allocated to irrigation.
- 5-7. Congress should abolish the 160-acre limitation in reclamation

projects constructed in the future; provided, however, that direct project beneficiaries pay the full costs of the projects allocated to irrigation.

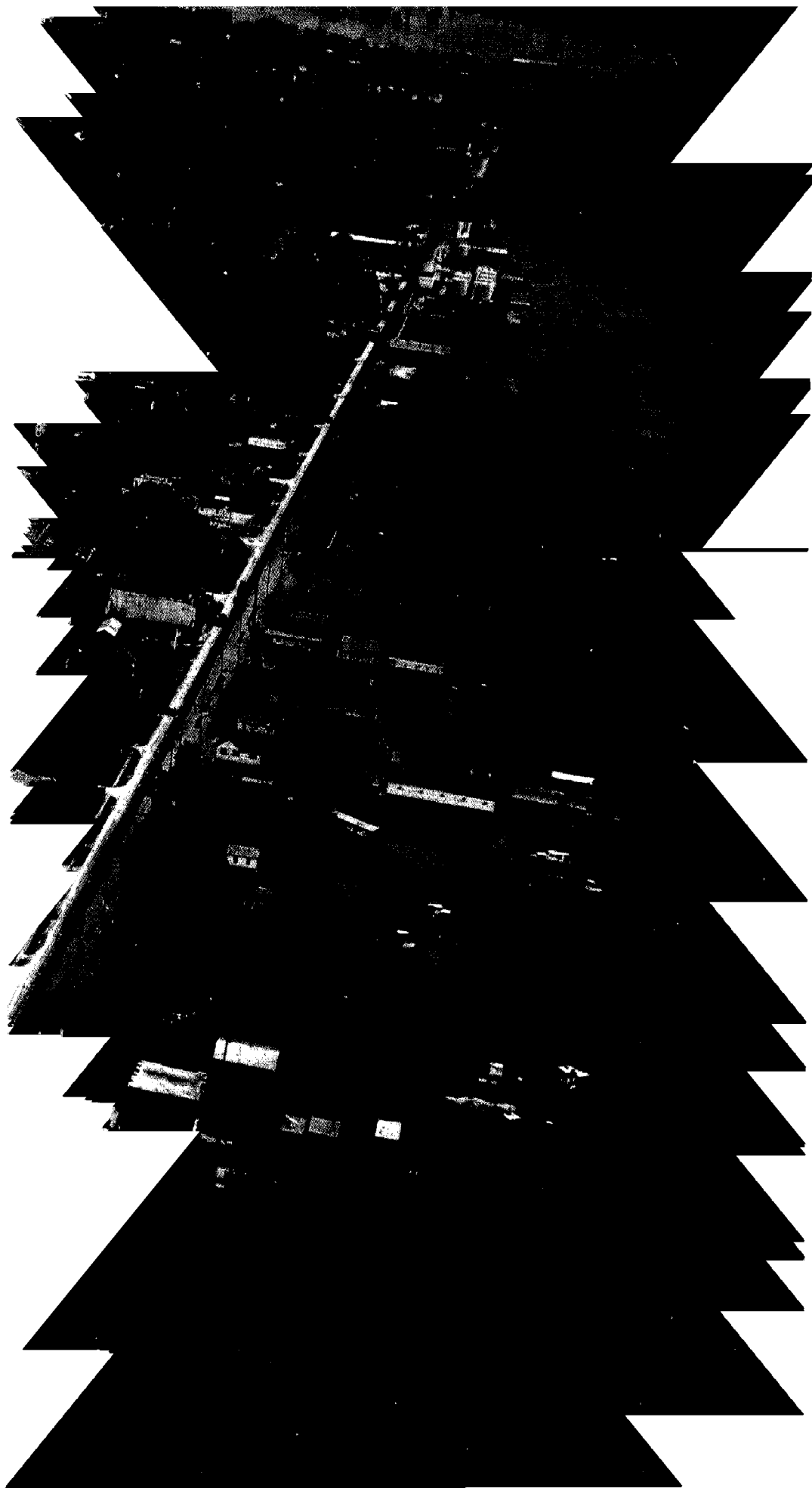
- 5-8. With respect to existing reclamation projects, Congress should enact legislation authorizing four distinct ways in which the acreage limitation may be lifted.
- a. Any irrigation district should be able to make a lump-sum payment of the balance remaining due on a contractual obligation incurred for irrigation and receive an exemption from the acreage limitation.
 - b. Any irrigation district should be able to pay interest on the balance remaining due on a contractual repayment obligation incurred for irrigation and receive an exemption from the acreage limitation.
 - c. Any landowner who has executed a recordable contract to sell excess acreage should be able to retain that excess acreage by making such lump-sum payment or by paying such interest assigned to all the land he owns within a project, including his original 160 acres. Project costs should be apportioned on an acreage basis.
 - d. Any landowner who wishes to acquire excess acreage should be able to do so and receive reclamation water if he makes such lump-sum payment or pays such interest as is assigned to all the land he will own within a project, including his original 160 acres.

Section E. Programs for Reducing Flood Losses

CONCLUSIONS

The United States has made heroic efforts to protect the lives and property of those who live on flood plain lands, and to maintain the flow of wealth that results from the use of these lands. Citizens in all parts of the Nation have been content to see billions of dollars spent to help fellow citizens subject to loss of life or fortune. But, throughout the many years that this benevolent effort has been under way, other individuals have been busily developing other flood plain areas in such ways that the initial goal of rescuing those unfortunate enough to be endangered by floods has become less and less attainable. Obviously, there must be a drastic change in the Nation's attitudes and programs. In the foregoing appraisal, this Commission has attempted to focus attention upon the main deficiencies of the present programs.

The rectification of the deficiencies mentioned will require concerted action by the Congress, the President, and the agencies involved. The Water Resources Council, if strengthened in the ways suggested in this report, will



Flood plain development and flood control costs should be weighed against costs of developing flood-free land.

be able to exert a powerful influence in implementing the recommendations offered by this Commission. But over and above the official actions called for by these recommendations, there is a need for a better understanding by the public at large of the basic nature of the flood problem, and in particular, an understanding that the ultimate goal of all public flood control programs should be the *best* use of the Nation's flood plain lands.

RECOMMENDATIONS

- 5-9. Flood plain lands should be treated as an important resource and should be managed so as to make the maximum net contribution to national welfare, keeping in mind (a) that the material wealth of a nation is not enhanced by development of any tract of land subject to flood overflow unless the net value of the resulting production exceeds the costs of development plus the flood losses (or the cost of preventing such losses) and (b) that any nonmaterial values sacrificed through development must also be counted as a cost.
- 5-10. In formulating plans for flood loss reduction full and equitable consideration should be given to all practicable alternative measures for achieving that goal, with a view to finding the best combination of such measures, using the evaluation principles recommended in Chapter 10 of this report.
- 5-11. The present trend toward greater use of flood plain regulation as a means of reducing future flood damages, or of reducing future costs for protective measures, should be strengthened by the following Federal actions to encourage wise use of flood plains:
 - a. Enactment of legislation to authorize the Water Resources Council to make Federal grants to the States to be used for mapping flood plains, determining flood hazards, making flood plain management plans, establishing State standards for flood plain regulation activities, and assisting local governmental entities in carrying out flood plain management programs; these grants not to exceed 50 percent of the amount expended by the States for such purposes.
 - b. Amendment of Section 206 of the Flood Control Act of 1960 to require that reports prepared thereunder provide, in addition to flood hazard information, (1) a comparison of the cost of creating values by further development of the flood plain lands with the cost of creating these same values by available alternative measures (such as development of nearby uplands) and (2) a delineation of those flood plain areas that could be of greater value to the Nation if used for open spaces (such as city parks).

- c. Removal of present legislative limitations upon the amounts that can be appropriated for flood plain management studies in any one year.
 - d. Increasing the funds available for carrying out the cooperative flood plain mapping program of the U.S. Geological Survey, the National Oceanic and Atmospheric Administration, and the Corps of Engineers.
- 5-12. Existing programs, such as the Land and Water Conservation Fund and urban park grants through which Federal assistance may be extended to State and local entities to encourage the establishment of parks and other open spaces, should be utilized to the fullest practicable extent to encourage public acquisition of those flood plain lands for which the best use is found to be for recreational or open space purposes.
 - 5-13. The requirements of Executive Order No. 11296 should be strictly observed by the Federal agencies to which the order applies, and in particular those agencies should refrain from making any grants or loans, or from insuring any loans that would be used for construction in flood plains or for the reconstruction of structures that have been seriously damaged by floods, unless adequate provisions have been made to prevent the repetition of such damages by flood-proofing or other means.
 - 5-14. Executive Order No. 11296 should be amended to require that all Federal programs within areas covered by a flood plain management plan shall comply with such plan provided it has been approved by the entity representing the community affected, by the responsible State organization, and by the Corps of Engineers or other appropriate Federal agency.
 - 5-15. The Water Resources Council should promulgate guidelines at the earliest practicable date to govern the formulation of flood loss reduction and flood plain management plans to be used in future water resources planning.
 - 5-16. The flood forecasting program of the Federal Government should be substantially strengthened by organizational changes along the lines recommended in Chapter 11 of this report and more adequate financing should be provided.
 - 5-17. Communities located in areas subject to flash floods should develop a community action plan to permit prompt response to a flood threat whenever it develops. Communities should develop methods of flood forecasting based on rainfall information from upstream watersheds and should use automatic warning devices where they are found to be feasible.
 - 5-18. The Water Resources Council should develop a plan for a unified national program for the collection of basic data on floods and flood

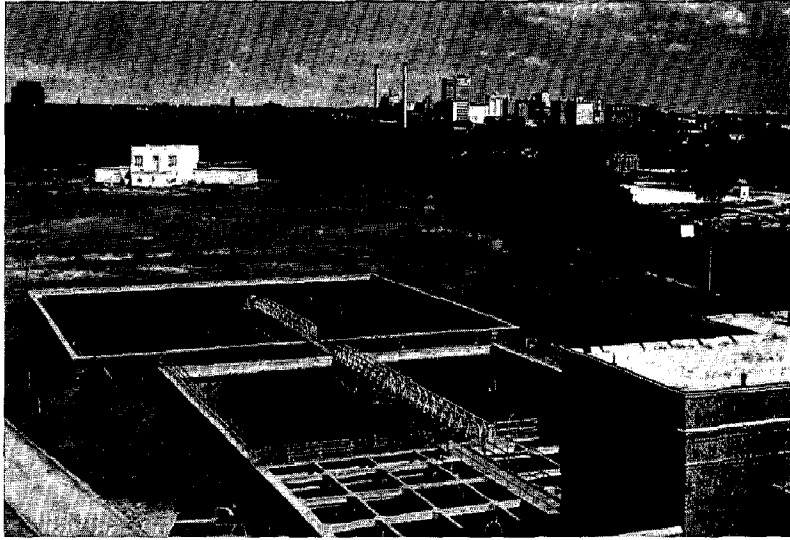
damages as recommended by the Task Force on Federal Flood Control Policy as set forth in House Document No. 465, 89th Congress, to be implemented, to the extent possible, by executive order, and if necessary by legislation to be proposed by the President.

- 5-19. The General Accounting Office, or other appropriate independent agency, should make an appraisal of the flood insurance program being carried out by the Department of Housing and Urban Development under the authority of the National Flood Insurance Act of 1968.
- 5-20. Future Federal or federally assisted projects, including structural measures for the control of floods, should comply with the following provisions:
 - a. The share of the cost of the project to be borne by non-Federal interests should be in accord with the cost-sharing principles recommended in Chapter 15 of this report.
 - b. The Federal agency proposing the work, or proposing a Federal contribution thereto, should demonstrate by an evaluation in consonance with the principles recommended in Chapter 10 of this report that the sum of all beneficial effects would exceed the sum of all costs, with due consideration being given both material and nonmaterial benefits and costs.
 - c. The State or a responsible local governmental entity should agree to regulate the use of flood plain lands to the extent necessary to prevent further developments that would (1) make necessary the installation of additional protective works or (2) be subject to substantial damage in the event of a flood exceeding the magnitude of the design flood.
- 5-21. Any Federal legislation to authorize a program of land-use planning should include special provisions for the coordination of any plans made under that program with flood plain management plans made by the States and the Federal water resources planning agencies.

Section F. Municipal and Industrial Water Supply Programs

CONCLUSIONS

The foregoing appraisal of the Federal programs presents a list of deficiencies that may be taken as the conclusions of this Commission as to reforms needed. These need not be repeated here. However, the studies it has made to evaluate future needs for municipal and industrial water, and its investigations of metropolitan problems on a broad front, have led the Commission to a few general conclusions which influenced the formulation of the recommendations which follow. These general conclusions are briefly stated in the following paragraphs.



Effective planning today for growing urban area water services can help relieve serious water shortages in the future.

It seems certain that population growth, increasing per capita use, migration of people to urban areas, and expanding economic activity will strain many existing municipal and industrial water supply systems in the years to come. Effective planning followed by effective implementation measures will be required if serious shortages of water service for the Nation's cities are to be avoided. In the more water-scarce and rapidly growing areas, completion for water supplies will mount and improved water husbandry will become increasingly necessary.

Studies made for and by the Commission have led it to conclude that while Federal assistance to rural communities in the form of water facilities grants and loans is beneficial to these rural communities, their influence upon population distribution is limited. Such assistance alone will not materially affect or reverse the flow of population from rural to urban areas, a trend which is beyond the ability of water facilities significantly to influence.

A further conclusion of the Commission is that problems of drinking water quality and safety of service have been demonstrated on a national basis, that this justifies the promulgation of Federal drinking water standards, and that the Federal standards should be implemented primarily by the States. A related conclusion is that present research and development programs should be strengthened.

Finally, the Commission reached the conclusion that there is a considerable element of inequity in the policies that presently govern the programs through which grants and low-cost loans are made available to communities. Under these programs, communities that have been conscientious in planning and diligent in building water supply facilities will be unable to demonstrate an urgent need for assistance and for this reason will be denied grant funds. Other less conscientious communities that have been derelict and as a result

find themselves with inadequate supplies will be able to demonstrate urgent need and, accordingly, will be awarded grants. Because grant funds derive from the general fund of the Treasury, the taxpayers at large are obliged to subsidize, and thus reward, communities which in the past have not made adequate expenditures for water supply facilities. On the other hand, those communities (and their taxpayer-residents) that have taken seriously their obligations to provide themselves with adequate water supply facilities, and who have made the necessary sacrifices to do so, are penalized; they pay the taxes but do not share in the benefits. This is certainly not calculated to instill in the Nation's communities a resolve to provide for themselves those services which are appropriately a local community's responsibility and which, in the absence of extenuating circumstances, should not be subsidized.

The Commission believes that subsidies are only justified if they serve some compelling social purpose; where society benefits but where conventional markets and pricing mechanisms do not adequately reflect those benefits, the Commission believes that a general rule to follow is this: direct beneficiaries of water projects who can be identified and reached should ordinarily be obliged to pay all project costs which are allocated to the purpose from which they benefit.

RECOMMENDATIONS

- 5-22. A national policy should be developed and enacted into law to clearly delineate the role to be played by the Federal Government in the provision of water for municipal and industrial use:
 - a. Primary responsibility for the provision of municipal and industrial water supplies should remain with non-Federal public entities and private enterprise.
 - b. Agencies of the executive branch should encourage cities and other non-Federal public entities to operate their water systems on a utility basis, the revenues of which should be sufficient to cover all costs.
 - c. Except for water used on interstate carriers, the responsibility for enforcing any drinking water standards established by the Federal Government should be discharged by the States and their political subdivisions.
- 5-23. All existing legislative Acts authorizing any Federal agency to assist non-Federal entities to plan or construct projects for supplying municipal and industrial water should be amended to eliminate any inconsistencies with the national policy that would result from the previous recommendation.
- 5-24. The agencies responsible for preparation of comprehensive river basin or other regional water plans, and the agencies responsible for urban planning, should jointly develop more effective means of cooperation and coordination, as recommended hereinafter in

Chapters 10 and 11.

- 5-25. City governments and metropolitan regional entities should develop and put into effect water conservation plans designed to reduce waste and make more efficient use of their present municipal and industrial supplies.
- 5-26. Present means for the coordination of grant and loan programs should be made more effective, and as an initial step in this direction, the Integrated Grant Application Program should be broadened to encompass grants and loans for construction.
- 5-27. Research essential for the development of better drinking water standards, and of improved means for testing water supplies for compliance with those standards, should be accelerated, along with research for the purpose of improving methods of renovating wastewaters for direct human consumption as detailed hereinafter in Section H of Chapter 7.

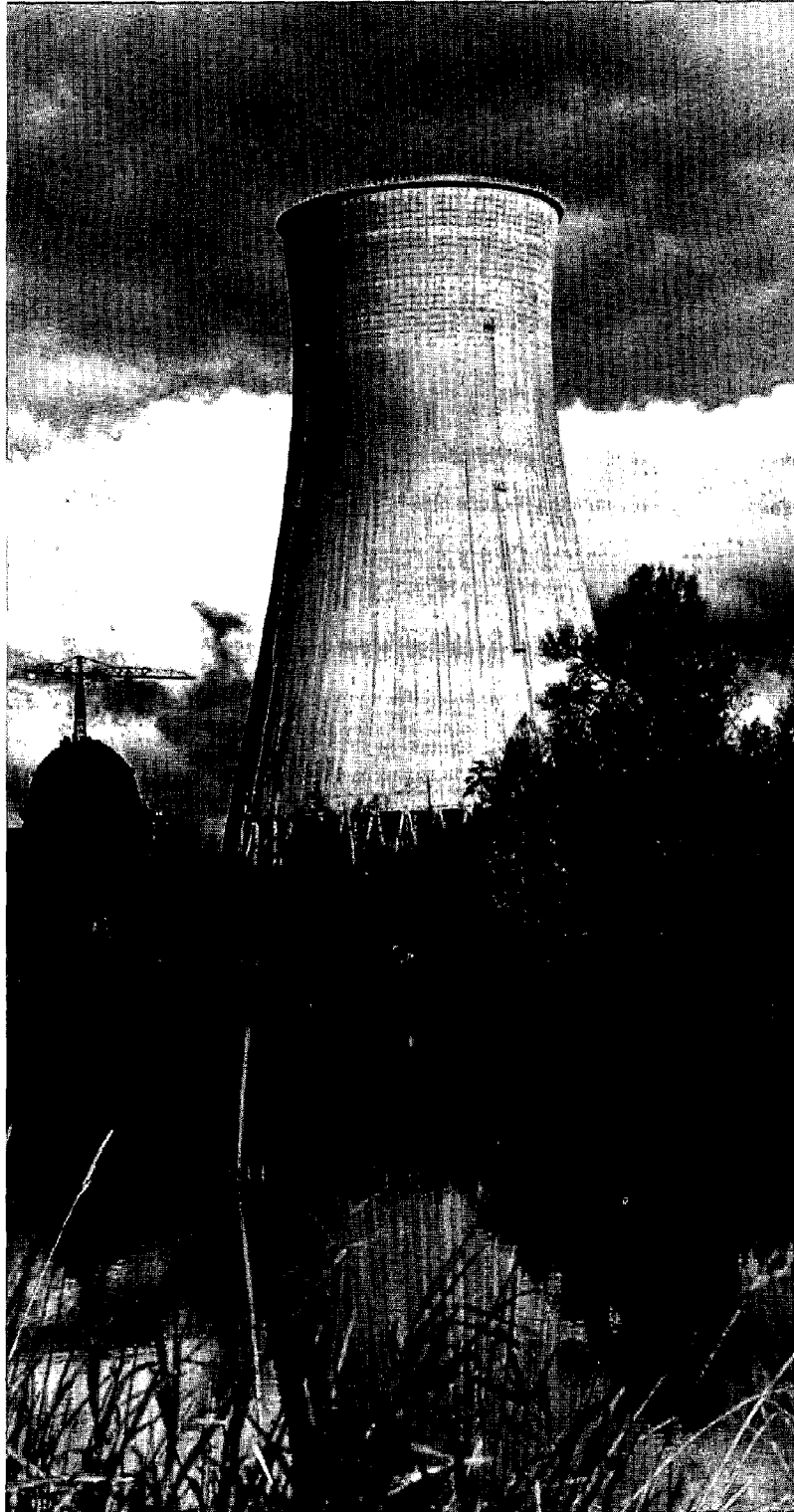
Section G. Power Production – The Waste Heat Problem

CONCLUSIONS

Demand for electrical energy in the foreseeable future will continue to increase even if not at the present rate of doubling every 10 years. Major reductions in electrical energy use are unlikely, especially in the near term. Hence, reduced electrical energy requirements cannot be counted on to provide relief from the need for more powerplants or from the waste heat problem during this period. Reducing the rate of expansion in electrical energy usage would, however, reduce somewhat the need for additional generating facilities and would yield a number of other benefits.

Present electrical energy-using equipment and appliances are far from the most efficient possible, even under present technology. Most present-day building construction and appliance manufacturing companies employ designs with a low first cost and with resultant high energy consumption, as opposed to a higher first cost and a subsequently lower long-term energy usage. The Federal Government has the opportunity to influence the more efficient use of energy through widely diversified federally supported research and development programs, and in the design of federally supported and financed facilities and facilities designed primarily for the use of the Government. This influence should be used as the first step in the development of a national policy of energy conservation.

Two perspectives are needed in addressing the issue of siting future steam electric powerplants. One perspective must deal with the near to intermediate term, during which powerplants must be planned, designed, constructed, and operated using currently proven and available technology. This period is expected to include much of the remaining part of the 20th century. The



By Portland General Electric Co.

Cooling towers and other alternatives to control waste heat from power production help protect the environment.

second perspective must deal with that period beyond the turn of the century when current and future research and development efforts might have a significant impact on the means of energy generation. This later period, though less predictable, should provide greater flexibility of choice among more alternative courses of action.

Waste heat can be dispersed to the biosphere in various ways, all of which must be considered in the establishment of policies concerning environmental quality. In order to assess adequately the total environmental impact of heat release, it is necessary first to assess the alternative controlled release mechanisms in terms of their overall environmental impact, including local concentration effects.

The ability of water to absorb heat is a valuable natural resource which, under many conditions, can have high utility in diluting, dispersing, and dissipating waste heat. However, for protecting various uses of water, such as providing habitat for aquatic life, there must be a limit to the use of water for this purpose. Where heat input will adversely affect important aquatic life or other environmental values, permissible heat inputs will have to be allocated among the various heat contributors (who might then have to resort to auxiliary cooling methods).

While a great deal of information is available on the effects of heat additions on the aquatic ecology, there is need for:

1. a data center and retrieval system whereby information concerning thermal effects is readily available;
2. an efficient feedback of research needs;
3. standardization of sampling, measuring, and research techniques;
4. continual assessment of predictive modeling technology; and
5. a regularized system of pre- and post-operational monitoring studies to determine the environmental effects of plant operation.

Temperature standards should be based on an adequate recognition of geographical, hydrological, and seasonal differences and the diversity of ecological systems. A systematic, flexible, and well-financed environmental research program is needed to provide the kinds of information on which rational standards may be set and on which informed decisionmaking may be based, in particular with respect to the effects of temperature and temperature change on aquatic life.

Water resources planning studies should be broadened in focus to include greater consideration of sites for steam electric power generation and their possible effects on the water environment.

New technologies are not expected to have a significant impact in providing relief from the waste heat problem in the near term. For the intermediate and longer term, however, a number of technological possibilities in the areas of generation, cooling, transmission, beneficial-use and multiple-use systems, and new siting alternatives could mitigate significantly the adverse effects of powerplant operation on water resources. An

accelerated research and development program is a necessity if the Nation is to meet the demands for electrical energy and a quality environment in a timely and orderly manner.

RECOMMENDATIONS

- 5-28. The President and the Congress should develop and implement a national policy of energy conservation. As an immediate step in this direction, the President should issue an executive order directing the agencies of the Federal Government to give greater consideration to reducing energy requirements in their own activities, such as housing, transportation, defense, and environment, and to exercise such influence as they may have over non-Federal interests to further the Federal policy.
- 5-29. Appropriate Federal agencies and power utilities should undertake a greatly expanded research and development program with the following objectives:
 - a. To develop more efficient and environmentally compatible means of generating electrical energy (including fuel cell, MHD, the breeder reactor, advanced power cycles, nuclear fusion, geothermal, and solar energy).
 - b. To develop more effective means of managing large quantities of waste heat discharge and for dealing with problems arising as a result of cooling system operation.
 - c. To develop and assess new siting alternatives in order to increase siting options (including the development of better means of electric power transmission).
 - d. To develop means of combining electrical power generation with other processes in multiple-use systems as well as means of beneficially using waste heat discharge with a view to more efficient total energy use.
- 5-30. Federal water pollution control legislation should recognize the capacity of receiving waters to absorb heat as a valuable resource.
- 5-31. The water and related land resources planning studies undertaken under the Water Resources Planning Act should, in cooperation with private interests, be broadened to provide more attention to potential powerplant sites and the effects which powerplant siting and operation may have upon other land and water uses. The Water Resources Council, assisted by a work group made up of representatives from industry, Federal and State agencies, and the general public should provide policy and procedural direction.

Section H. Erosion and Sedimentation Damage Control Programs

CONCLUSIONS

The Federal programs that have been initiated over the years for the purpose of decreasing soil losses in rural areas have been relatively successful in achieving their objective. This Commission has not detected a need for a change in their basic nature, or for the diversion of any larger proportion of the national income to this purpose. Undoubtedly, however, the newer national goal of improving the quality of the Nation's rivers will have the effect, over a period of time, of according preference to those measures most effective in reducing the quantities of nutrients that reach the streams. It may also have the effect of increasing Federal expenditures in some areas and decreasing them in others, depending upon the demand for water quality improvement in the various parts of the Nation.

The Commission understands that erosion and sedimentation problems in urban areas are becoming progressively more serious. Undoubtedly, much eroded material may be washed from raw construction sites and undoubtedly this is causing considerable damage in some cities. But this Commission fails to see the necessity for the Federal Government establishing a program for the purpose of solving a problem that the local governmental entities can themselves virtually eliminate by regulating those actions of landowners and builders that create such problems.

The attention of the Commission has also been called to the fact that the first flush of storm runoff from urban areas can carry a considerable load of pollutants into the streams. There is much evidence that this is true. It is not evident, however, that dangerous pollutants are carried by material eroded from raw construction sites. And even if in some instances this should be true, it does not alter the fact that the local governmental entities have the power to put a stop to excessive erosion from lands under their jurisdiction without calling upon the Federal Government for help. The Commission is compelled, therefore, to take the same position with respect to erosion in urban areas that it took—in Section E of this chapter—with respect to the closely related problem of reducing those flood losses that result from storm runoff originating within urban areas.

RECOMMENDATIONS

- 5-32. Special attention should be given in the planning and carrying out of soil conservation and other programs that can bring about a reduction in the surface runoff and erosion originating on rural lands, to those measures capable of decreasing the amounts of harmful pollutants entering the stream system including, but not limited to, such pollutants as pesticides, animal and human wastes originating on feedlots and farmsteads, and nutrients applied to the

land in the form of inorganic fertilizers. Activities such as channelization of streams which may augment sedimentation should be avoided.

- 5-33. Primary responsibility for the reduction of damages resulting from urban erosion and sedimentation should remain with local governmental entities, and Federal assistance should be limited to the provision of technical advice.

Section I. Recreation at Reservoirs

CONCLUSIONS

Outdoor recreation in general and water-based recreation in particular have become major national economic and social activities. Water is an important outdoor recreation resource and is the focal point of half or more of all outdoor recreation. Recreation is becoming a progressively more important service which water provides for people. Although some Federal reservoirs are even more intensively used by recreationists on peak user days than many national parks, the 56,000 miles of shoreline in Federal reservoirs possess substantial undeveloped recreation potential which should be developed for public recreation use.

Some Federal impoundments are overused and others underdeveloped with respect to water-based recreation. Some are either close to population centers or in arid areas where natural water resources are scarce. Not all Federal reservoirs, however, are ideal recreational sites because of topography, location, drawdowns, and other problems. What is urgently needed is a careful assessment of existing and proposed reservoirs to identify those which are prime recreational sites and a program of achieving the necessary recreational development at these prime sites.

Congress, especially during the last decade, has declared a national policy and enacted a strong legislative base for outdoor recreation, about half of which is water-oriented. In addition, through numerous acts, Congress has directed special attention to recreation at Federal and federally assisted reservoirs. The Commission endorses the present policies of Federal outdoor recreation investment in projects related to reservoirs and other water bodies.

The Secretary of the Interior should utilize to the fullest his authorities in P.L. 88-29 to provide technical assistance to the private sector, particularly in developing water-based recreation facilities.

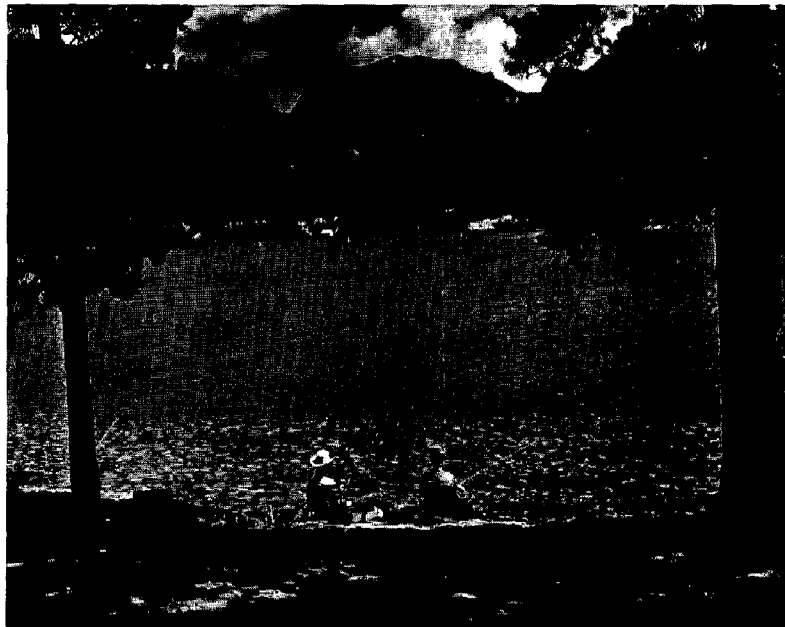
The problems of the Federal agencies concerned with the development of recreation at Federal reservoirs appear to result largely from inadequate staff with the proper expertise to develop good recreational plans at existing or proposed reservoirs. This shortage is made worse because efforts are dispersed over all reservoirs rather than over those reservoirs which show the highest recreation potential. Finally, there is inadequate staff on site for management

of the facilities, collection of user fees, and other necessary on-site functions.

RECOMMENDATIONS

- 5-34. Each construction agency should develop a central staff with the necessary expertise in recreation planning. This staff should be responsible for deciding which Federal reservoirs have important recreational potential deserving of development and should provide the plans necessary for effective development and management of these sites.
- 5-35. For those reservoirs considered to be prime recreational sites the construction agencies should procure the necessary recreational lands as part of the overall land acquisition program.
- 5-36. Executive Order No. 11508 should be amended to exclude from declaration as excess, lands at Federal reservoirs which have potential for recreation development or access sites within 20 years. Construction agencies should be authorized and funds provided them not only to retain such land as now owned, but also to acquire additional land as needed if such land meets the criterion of potential value for recreation within a 20-year period. Such lands should be classified for retention in Federal ownership.
- 5-37. Recreation admission and user fees should be charged at all Federal reservoirs where revenues can be expected to exceed the costs of collection. In addition to implementing the criteria already enacted into law with respect to admission and recreation use fees, charges

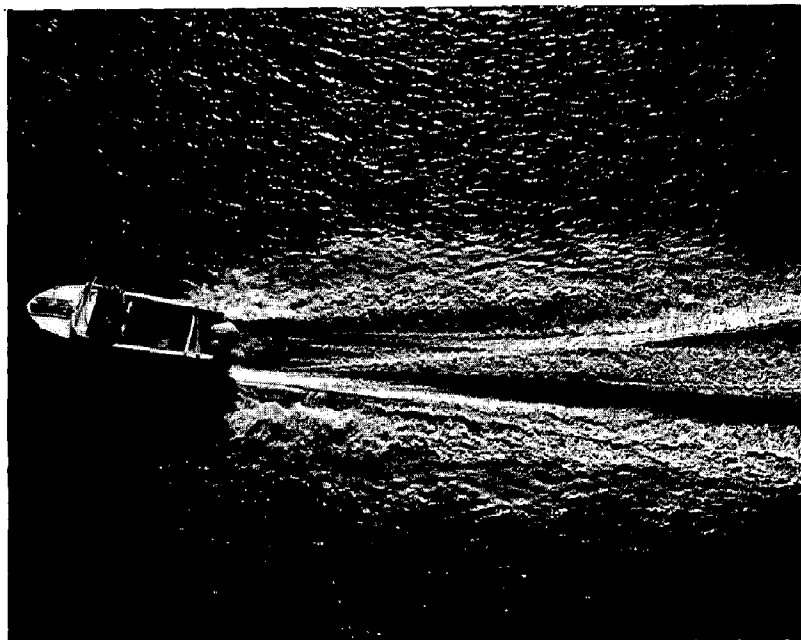
Admission and user fees should be charged at all Federal reservoirs where revenues can be expected to exceed costs of collection.



should be related to fees charged for nearby comparable private facilities and to that portion of operation and maintenance costs attributable to the specialized facility for which a user fee is assessed with the objective of having the amount collected from fees equal the O&M cost for that particular facility.

- 5-38. The Bureau of Outdoor Recreation should devise a system of data collection which will provide accurate information on visitation at existing reservoirs and on the nature and purpose of these visits. The system should be used by all agencies managing recreation facilities at reservoirs and should be designed to provide a base which can be useful in estimating recreation requirements and benefits of future reservoirs.
- 5-39. In evaluating the recreational benefits of proposed reservoirs full consideration should be given to the recreational opportunities in free-stream fishing, white water boating, and other benefits foregone if the reservoir is constructed. The Nation should match its program of reservoir construction with a program of stream protection for the purpose of obtaining an effective mix of water-based recreational opportunity.
- 5-40. Those agencies responsible for the administration of recreational facilities at existing Federal reservoirs should make a careful study of the financing required to place these facilities in proper condition, and to staff the project with the people necessary to properly manage, maintain, and collect user fees at these sites.
- 5-41. A national policy to protect and manage islands or portions thereof

Recreational benefits of proposed reservoirs should be compared with those that might be lost if a reservoir is constructed.



which possess unique environmental and recreational values should be developed. Legislation should be enacted to create a national system of Federal and State islands to supplement other national and State conservation systems of parks, forests, recreation areas, wild and scenic rivers, trails, seashores, lakeshores, and wilderness areas. Financing of such a system should be authorized under the Land and Water Conservation Fund Act.

***Section J. Improving Federal Water Programs
from the Standpoint of Fish and Wildlife***

CONCLUSIONS

Fish and wildlife values have suffered damage as a result of water-related activities. The present protections afforded by the Fish and Wildlife Coordination Act and the National Environmental Policy Act seem to be adequate to prevent unreasonable or unnecessary damage to these resources under future projects constructed or licensed by the Federal Government. While there has been some complaint that fish and wildlife interests have not been considered at the initial stages of water project planning, the Coordination Act requires those values to be considered as part of the planning process. Failure to treat fish and wildlife on an equal basis with other project purposes is violative of that Act. Moreover, the U.S. Water Resources Council is in a position to require coordinated planning of fish and wildlife interests along with other project purposes in the river basin planning program conducted under the Water Resources Planning Act.

The Commission believes that joint participation of fish and wildlife agencies in project planning should begin at the initial stages of such planning; fish and wildlife agencies should not have to react to initial design plans of projects already formulated but rather should sit in on the initial development of those plans at the inception of project planning. This is what the Coordination Act requires and is the direction in which joint planning has been moving. The Coordination Act already provides that fish and wildlife be made a project purpose and planning objective the same as all other purposes and objectives. The Commission believes that this kind of coordinated planning, with early and active fish and wildlife agency participation, should be continued and, if necessary, strengthened. Without passing judgment on the validity of complaints that fish and wildlife have not been considered at the early stages of project planning, the Commission believes that the Water Resources Council should be able to require that the intent of the Coordination Act is satisfied in the planning undertaken under the aegis of the Council.

The Commission does not believe that final plans for a Federal water project which do not meet with the enthusiastic endorsement of fish and

wildlife interests are necessarily inappropriate or that fish and wildlife purposes have perforce been inadequately taken into account. There will be occasions where conflicting views will not be susceptible to reconciliation, where the position of one interest will be irreconcilably at odds with that of another. No amount of legislation can compel enthusiastic acceptance of project plans by fish and wildlife interests when they believe such plans to be defective. What is required is the mechanism to assure fair and honest consideration of all views and all project purposes on a fully participating and coordinated basis. Where disagreements cannot be satisfactorily resolved, the conflicting viewpoints should be transmitted to the Congress for resolution at the time the project is being considered for authorization. The Commission believes that the Water Resources Council has an important supervisory and coordination role to play in this arena. Not only must it insure that fish and wildlife receive proper attention along with other project purposes at the time of project plan formulation, but it can act as a mediator to help resolve opposing views before conflicts are put before Congress.

Much of the controversy over fish and wildlife problems associated with proposed water projects and water-related activities stems from insufficient knowledge about the prospects for damage from such projects and activities. Too little is known. Fish and wildlife interests are understandably reluctant to endorse project plans when there is doubt about the impact of the proposed project upon fish and wildlife values. Where such doubts exist, it is the natural inclination of fish and wildlife interests to resolve the uncertainties in favor of opposition to projects. An obvious way to reduce doubts and permit everyone to proceed with greater assurance and certainty is to gain additional knowledge. This can best be done through carefully designed research into the impact of projects and water-related activities upon fish and wildlife values.

Some water-related activities are beyond the coverage of the Fish and Wildlife Coordination Act and NEPA, particularly non-Federal projects on non-navigable inland waters. Since the States have jurisdiction over these waters, adequate measures to protect fish and wildlife should be provided by State statutes to fill this void where it is not already filled.

RECOMMENDATIONS

- 5-42. The Fish and Wildlife Coordination Act requires that fish and wildlife conservation receive equal consideration and be coordinated with other features of water resource development programs. To the extent that observance of this statutory requirement is breached, the Coordination Act should be more rigorously applied. The Water Resources Council should supervise and coordinate Federal water project planning to assure that fish and wildlife values receive equal consideration with other project purposes, as required by the Coordination Act.

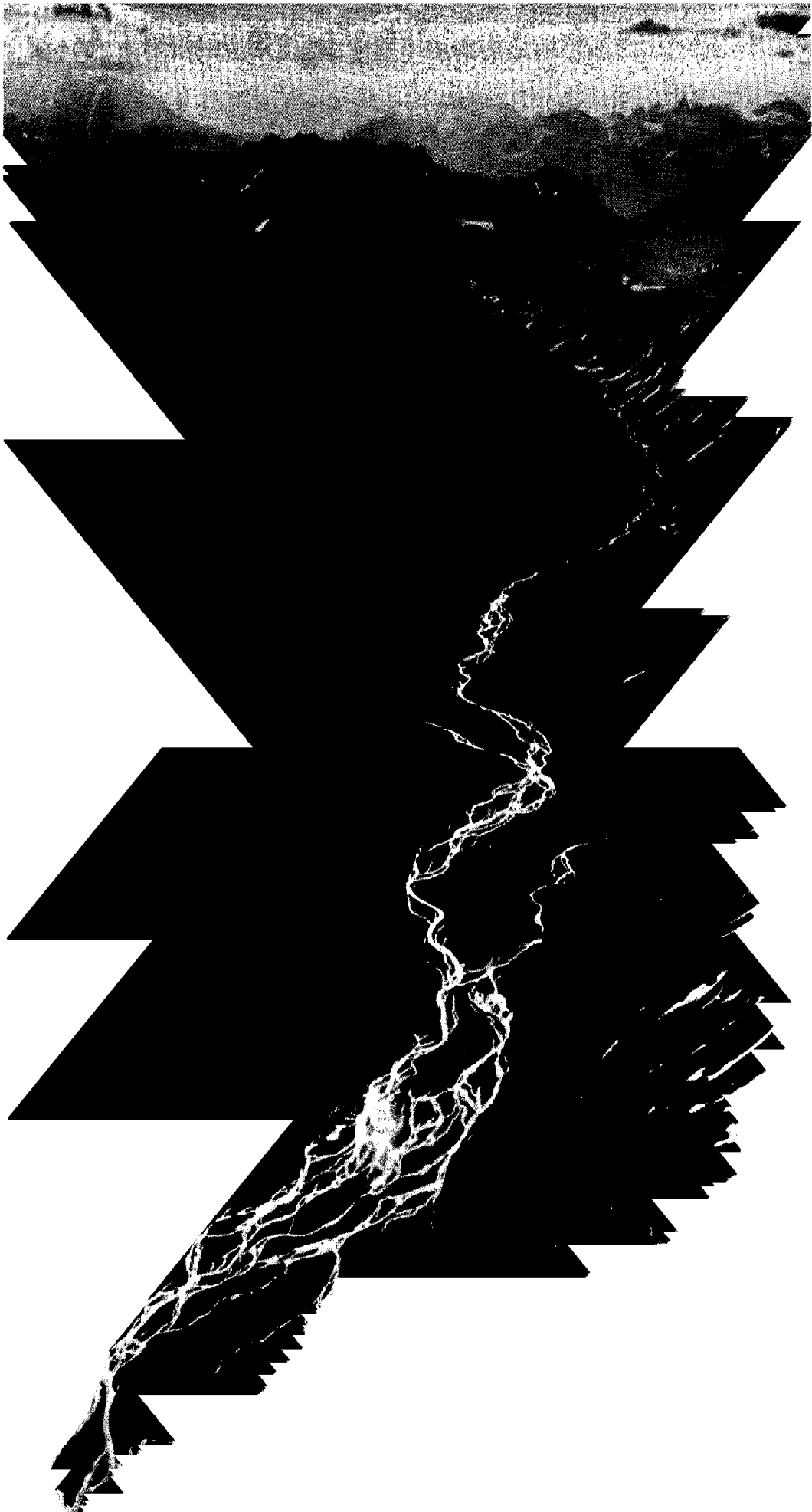
*Difficult choices are sometimes required between
environmental and developmental values,
such as is evident in decisions we face in Alaska.*

- 5-43. More research should be undertaken to resolve uncertainties about the prospective impacts of water resources projects upon fish and wildlife values. Systematic pre- and post-construction assessment of the impact of federally funded or licensed projects upon fish and wildlife and the efficacy of protection facilities should be undertaken in order to displace conjecture with well-documented facts.
- 5-44. On nonnavigable inland waters, where many activities such as dredging and channel alteration are beyond the scope of Federal law, the States should provide statutory protection for fish and wildlife values. In particular, State statutes should provide that fish and wildlife be made a project purpose and receive equal consideration with other project purposes, comparable to the provisions of the Fish and Wildlife Coordination Act applicable to Federal projects.

CHAPTER 6. PROCEDURES FOR RESOLVING DIFFERENCES OVER ENVIRONMENTAL AND DEVELOPMENTAL VALUES

CONCLUSIONS

- 1. The Nation's record of taking important environmental values into account in the planning, evaluation, licensing, and construction of water resource projects has not been completely satisfactory. In the past, developmental values have tended to predominate.
- 2. The National Environmental Policy Act does much to meet previous deficiencies in taking environmental values into account and in striking a sound accommodation or balance among developmental and environmental values. However, the process could be improved by the adoption of additional measures supplementing NEPA.
- 3. Environmental review requirements, particularly under NEPA, have created uncertainties and delays. Delays, especially when a project is under construction or completed, can be costly and disruptive. The Commission is concerned that there are inherent possibilities for delay at critical junctures under present arrangements for environmental review and concludes that certain measures are needed to expedite that review.
- 4. Careful planning frequently can accommodate important developmental and environmental values in a harmonious solution.
- 5. Difficult choices must sometimes be made among important environmental and developmental values in particular cases where all such values cannot be accommodated, but it is possible to achieve a sound balancing of values, without unacceptable delay, through the use of appropriate procedures.



6. In considering a proposed water project or use, developmental values should not be sought irrespective of environmental values which will have to be foregone as a result; nor should any single level of environmental quality be protected irrespective of potential developmental values. Where important environmental and developmental values conflict and cannot be reconciled, the attainment of one must be viewed as a sacrifice of the other. Sometimes it will be rational to make substantial environmental sacrifices; other times it may not be worth even a small sacrifice. Only if the social benefits to be gained outweigh the social costs to be sacrificed should a proposed project or use be sanctioned.

7. Present arrangements with respect to non-Federal projects which require licenses and permits could be improved by the measures set forth in Recommendation 6-1.

8. Congress should continue to make the choice where important development and environmental values conflict with respect to proposed water projects requiring Federal authorization and funding, rather than delegate that responsibility to an executive balancing agency or to an agency with veto power over projects believed to be environmentally unsound.

9. Present arrangements for achieving an accommodation or a balance among important developmental and environmental values with respect to Federal water resources projects could be improved by the measures set forth in Recommendation 6-2.

RECOMMENDATIONS

- 6-1. The following measures should be adopted with respect to non-Federal projects which require licenses or permits to utilize the Nation's waters:
 - a. Planning and licensing responsibilities should be separated by the use of precertification planning.
 - b. Siting questions should be resolved and State and local environmental requirements satisfied by:
 - (1) Long-range planning for plant sites, with notice to the public and an opportunity for the public to participate in the planning.
 - (2) An authoritative determination of the suitability or unsuitability of a proposed site, in light of environmental and developmental values, well before the planned date of construction.
 - (3) A single certification proceeding capable of balancing values and resolving all questions of State and local law relevant to the siting of a particular proposed plant.
 - c. Delays during licensing hearings should be limited by limiting the number of intervenors, by allowing written statements, by prehearing conferences to settle side issues and limit testimony,

- by allowing for unified presentation by parties with similar interests, by circulating direct testimony in advance, by legislative-type hearings, or by some combination of these devices.
- d. NEPA review should be integrated into Federal licensing proceedings by the following measures:
 - (1) The staff environmental impact statement should be submitted for comments and notice of its availability should be provided at the time the notice of the licensing hearing is given.
 - (2) Licensing agencies should accept and encourage oral and written comments from the public on matters discussed in the staff environmental impact statement.
 - (3) Licensing hearings should commence only after a period of time sufficient for public review of and comment on the staff environmental impact statement.
 - (4) Comments on the environmental impact statement received from the public, and from Federal, State, and local agencies, should be submitted for the hearing record to permit the hearing examiner to assess whether the staff has developed an adequate evidentiary record with respect to the NEPA issues.
 - (5) The hearing examiner's decision should determine both the licensing and the NEPA issues, subject to review by the licensing agency and appeal of the agency's decision.
 - e. Federal licensing agencies should be authorized to rely upon proper determination by a State or interstate site planning agency that development at an approved site is consistent with a comprehensive plan, in order to limit the scope of alternatives to be considered during the licensing proceeding. Where the site planning agency makes a comprehensive examination of alternative site possibilities and evaluates the environmental and developmental attributes associated with them, Congress should authorize Federal licensing agencies to limit their consideration of sites to those approved by the site planning agency.
 - f. Licensing agencies' responsibility to consider alternatives should be united with the authority to license the alternative judged best.
 - g. Federal licensing and permit requirements should be consolidated so that issues which now are addressed by several Federal agencies shall be resolved in a single agency proceeding. Congress might designate one agency presently required to examine a proposed project as the lead agency to determine such issues, or provide for a consolidated proceeding before an entity constituted so as to assure a balanced approach, with the competence and responsibility to assess all relevant factors.

- 6-2. The following measures should be adopted to improve the accommodation or balancing of important environmental and developmental values associated with Federal water resources projects:
 - a. Better environmental information should be introduced into water resources planning through improved techniques of public participation and agency environmental analysis.
 - b. The public comment process under NEPA should be developed by encouraging written comments, or oral presentations in a hearing held by the project agency, on draft environmental impact statements, and by requiring project agencies to respond to such comments in preparing final environmental impact statements.
 - c. The proposed Board of Review, utilizing an environmental advocate or some other effective device, should examine the development agency's compliance with environmental requirements and the proposed balance among environmental and developmental values.
 - d. An environmental advocate should be employed by Congress to assure that important environmental matters are brought to its attention before it acts on a project.
 - e. Congress should determine the adequacy of a project's fundamental compliance with environmental requirements, including NEPA.
- 6-3. Congress should hold hearings on the issues raised by the NEPA requirement that Federal agencies consider alternative courses of action. These hearings should address the question of how far Federal agencies must go in identifying, developing, and evaluating alternatives; the appropriate procedures for this consideration; and the means of uniting the responsibility to consider alternatives with the power to implement the alternative judged best.
- 6-4. Congress should authorize Federal agencies having authority to determine, license, or approve the selection of a site for a powerplant or other water-using industrial plant affecting both State and Federal interests to enter into agreements with those States and interstate agencies meeting federally prescribed standards and criteria embodied in regulations to be promulgated for the purpose of enabling State and interstate agencies to establish their eligibility. Under the agreements an eligible State or interstate agency could be authorized to hold public hearings either independently or jointly with the Federal agency to consider siting or licensing proposals, or both, and make final determinations in accordance with applicable Federal and State laws and regulations and such additional guidelines as might be included in the agreements.

CHAPTER 7. MAKING BETTER USE OF EXISTING SUPPLIES

Section B. Improving Ground Water Management

CONCLUSIONS

Approximately one-fifth of America's present water withdrawals are derived from ground water. The ground water share of the Nation's water requirements is expected to increase because of increasing demands and the wide availability of ground water.

Ground water is often interrelated with surface water and the ways in which one is managed can often affect the other. Accordingly, ground water and surface water laws should be integrated and the two sources of supply should be managed on an interchangeable and coordinated basis where applicable.

Management can be undertaken by a statewide agency or at the local level by a water management district. Goals of optimum use can be achieved either by regulatory directives or by economic incentives. To be effective, water management agencies must be empowered with sufficient authority to get the job done—to insure that the combined ground-surface water supply is used efficiently and the aquifer protected from damage or premature depletion. It is most important that water management agencies have regulatory power, as well as the power to levy pump taxes or other kinds of charges on ground water withdrawals and that pumpers have the right to transfer water allotments.

So that Congress can judge the adequacy with which the States and localities are managing their ground water and surface water resources conjunctively, Federal agencies proposing Federal water projects should report on such ground water management programs.

In some parts of the country, ground water is being withdrawn faster than it is being recharged. This is called ground water mining and, although it is not necessarily undesirable, when done recklessly and without considering future prospects, it can result in serious economic repercussions. Mining water from a common pool which underlies numerous discrete land ownerships is particularly harmful because normal economic mechanisms which provide incentives to consider future consequences may not be operating.

A good way to insure that ground water is not inappropriately mined is to calculate its future value (properly discounted) and to charge users accordingly by means of a uniform pump tax. If the value of pumped water to a user exceeds the discounted-future-value charge, he will pump; otherwise he will not. Because of difficulties in accurately estimating future values, a pump tax can be set at a level to extend the life of a ground water aquifer to some date in the future which is conceived as the "appropriate" period of use for the aquifer. Another alternative is to set quota restrictions on the amount of water each user can withdraw based on historic use of each user. To assure

efficient allocation of the water, however, pumped water should be freely transferable by sale from one user to another.

Although it has not received as much attention as surface water pollution, ground water pollution may be more significant. Because surface water and ground water are so often interrelated and because the same water quality control expertise must often be applied to both, the agencies which monitor and enforce surface water pollution controls should be responsible for ground water pollution abatement as well, at both the Federal and State levels.

Another problem stems from the fact that one ground water pool may underlie two or more States. Little law has been developed for the regulation and management of such interstate aquifers. It is clear that interstate aquifers should be managed and regulated in the same fashion as intrastate aquifers. To do so, it is desirable that States enter into arrangements with one another to permit appropriate management and regulation of interstate aquifers.

Finally, it is apparent that there is a deficiency in the amount of technical data and other information about ground water resources, information which is needed to make sound decisions with regard to regulation and management. Fortunately, the U.S. Geological Survey has substantial experience in making ground water investigations. Its investigations should be expanded to fill in the gaps of present knowledge needed for effective and efficient management of ground water supplies. The information developed by these investigations should be transmitted, together with interpretations, to appropriate Federal, State, and local agencies and officials.

RECOMMENDATIONS

To effect the desired improvement in management of the Nation's ground water resources, and in light of the above conclusions, the Commission has developed 20 specific recommendations which are spelled out in detail in the body of this section. The first two call for better integration of ground and surface water use. Then follow four recommendations on ground water management, three on ground water mining, and six on pollution of aquifers. The final five recommendations propose improvements in ground water information systems.

- 7-1. State laws should recognize and take account of the substantial interrelation of surface water and ground water. Rights in both sources of supply should be integrated, and uses should be administered and managed conjunctively. There should not be separate codifications of surface water law and ground water; the law of waters should be a single, integrated body of jurisprudence.
- 7-2. Where surface and ground water supplies are interrelated and where it is hydrologically indicated, maximum use of the combined resource should be accomplished by laws and regulations authorizing or requiring users to substitute one source of supply for the other.

- 7-3. The Commission recommends that States in which ground water is an important source of supply commence conjunctive management of surface water (including imported water) and ground water through public management agencies.
- 7-4. The States should adopt legislation authorizing the establishment of water management agencies with powers to manage surface water and ground water supplies conjunctively; to issue revenue bonds and collect pump taxes and diversion charges; to buy and sell water and water rights and real property necessary for recharge programs; to store water in aquifers, create salt water barriers and reclaim or treat water; to extract water; to sue in its own name and as representative of its members for the protection of the aquifer from damage, and to be sued for damages caused by its operations, such as surface subsidence.
- 7-5. The States should adopt laws and regulations to protect ground water aquifers from injury and should authorize enforcement both by individual property owners who are damaged and by public officials and management districts charged with the responsibility of managing aquifers.
- 7-6. Any Federal agency seeking authorization of a Federal water project for an area having a usable ground water aquifer should describe and evaluate the ground water management programs in the areas.
- 7-7. Where ground water mining is occurring, the States themselves (or local management agencies) should immediately institute regulation of ground water withdrawal and conjunctive management of ground water and surface water, where the latter source of supply is available. Regulation and management can include levying of pump taxes, or implementation of quota restrictions with freely transferable pumping rights, or some other means, and should have as its purpose conservation and prudent use of the water resource. It can also include artificial recharge, improving infiltration capacity, and other management activities. It should take account of the value of present uses as compared to the estimated value of future uses, the desirability of preserving some ground water for future use irrespective of estimated future value, and such effects on the aquifer system from rapid depletion as loss of storage capacity and reduced transmissivity.
- 7-8. The President should issue an executive order directing Federal agencies charged with responsibility of water resource planning and development to include in all pertinent studies and project proposals a description of the ground water resource, whether or not ground water is being mined and, if so, the regulatory and management regime applicable to it, together with an evaluation of that regime.
- 7-9. Congress should scrutinize closely the economic justification for

water supply projects designed to supply supplementary water to areas that have mined ground water and should examine the circumstances giving rise to the project proposal including the presence or absence of ground water regulation and management, and their operation.

- 7-10. Funds should be granted to the U.S. Geological Survey to increase its study of ground water pollution, the causes thereof, and the relationship between surface water pollution and ground water pollution. The USGS should monitor ground water quality, giving priority to aquifers threatened by impairment of quality.
- 7-11. The States should regulate the drilling, completion, operation, and abandonment of wells for the purpose of protecting ground water quality. Well drillers should be licensed, permits should be required before drilling is permitted, and drilling and completion reports (including well logs where appropriate) should be required.
- 7-12. The regulation of ground water quality by the States should be the responsibility of the same agencies that regulate surface water quality.
- 7-13. A State agency should be responsible for identifying the adverse effects on ground water quality resulting from land use, and the States, or governmental subdivisions thereof, should regulate land use among other purposes so as to control or eliminate such adverse effects.
- 7-14. Any report on a water supply project proposed by a Federal agency should contain a full description of the quality of the local ground water, its suitability for use, the deterioration that has occurred in the last 20 years (if data are available), the ground water quality control program applicable in the area, and its adequacy.
- 7-15. Federal legislation on control of surface water pollution should be expanded to include ground water pollution, and the regulatory regime and enforcement techniques at the Federal level should be the same for both surface and ground water.
- 7-16. The U.S. Geological Survey should make continuing intensive investigation of significant aquifer systems giving priority to those with falling water tables and deteriorating water quality. The investigations should seek to determine:
 - a. aquifer boundaries, thickness, saturation, and transmissivity;
 - b. the suitability of overlying land and wells for artificial recharge programs;
 - c. depth of water, quality and temperature of water;
 - d. the storage capacity at various ground water levels;
 - e. the source of pollutants found in the aquifer;
 - f. natural discharge from the aquifer, principal withdrawals, sources and amounts of recharge, anticipated yields, and the effect of pumping on surface supplies;

- g. the extent of past ground water mining and the estimated economic life of the aquifer under various assumptions as to rates of withdrawal; and
 - h. the susceptibility of the aquifer to operation and management on a "sustained yield" basis.
- 7-17. Federal appropriations for the Federal-State cooperative study programs should be increased to meet the amount of matching funds available from the States.
 - 7-18. The U.S. Geological Survey (USGS) should report the results of these investigations to the Congress, the Water Resources Council, the Office of Management and Budget, the Environmental Protection Agency, the Governors, State engineers (or their equivalents), and State water quality control agencies of the affected States, and local officials, including city councils, county officials, and local water management officials.
 - 7-19. On the basis of data received from the USGS, the Water Resources Council should formulate recommendations for improved ground water management practices and transmit its recommendations to appropriate Federal, State, and local officials.
 - 7-20. Federal and State courts should be empowered to obtain the services of the USGS in water litigation for water supply and quality investigations, and these services should be available at cost, subject to the availability of personnel and other resources to conduct the investigations.

Section C. Pricing as a Means of Motivating Better Use

CONCLUSIONS

Pricing is becoming increasingly important. As water demands increase, use will press more heavily on the given natural supplies, costs of diversion and delivery will increase, and competition and interaction among uses will be more intense. Pricing, including allowance for the value of the resource itself, can help to bring about better use of the Nation's water resources.

As valuable as pricing of water can be toward motivating better use, it cannot be relied upon exclusively to achieve always the highest and best use from an overall social standpoint. It should not, for example, be allowed to lead to improper land use. Land use planning should set constraints on the use of both land and related water so that when water pricing is implemented, the resulting use from a social standpoint is indeed the highest and best. Likewise, pricing cannot be relied on to preserve environmental quality, and water quality standards will have to be established outside the pricing mechanism.

A uniform nationwide system of prices, surface water diversion charges,

and pumping taxes would also be inappropriate. The structure of user prices or withdrawal charges imposed should vary from area to area and from situation to situation depending on conditions (e.g., large unused system capacity versus full utilization of existing capacity).

In some areas, the costs of providing water services are comparatively low and provide a temptation to set prices that yield revenues in excess of costs. This may be true for many municipalities that are financially pinched and look upon water service facilities as a means of raising revenues for unrelated municipal purposes. The Commission disapproves of setting water supply and sewerage charges at levels which not only fully recover costs but also return additional "excess" revenues for nonwater purposes. The purpose of pricing water and water-related services is to encourage more prudent and efficient use of water, not to raise revenues beyond that required to cover costs.

The Commission recognizes that provision of water supply and sewerage services benefits affected properties. These benefits from construction of water supply and sewerage facilities become capitalized into the value of the properties served. Hence, the Commission concludes there is justification for imposing a combination of charges and assessments to recover costs. It may be appropriate, for example, to (1) levy a special assessment based on front-footage or acreage of benefited property to recover construction costs of a water or sewerage system and simultaneously diminish unintended windfalls to property owners, and (2) charge a price per unit to recover operation and maintenance expenses.

The Commission concludes that systems of pricing and user charges that recover the full costs of water services directly from users will conserve water supplies, discourage premature investment in water development projects, reduce financial burdens now borne by nonusers, and, most important, make the use of scarce resources more efficient.

RECOMMENDATIONS

- 7-21. Water management agencies should review their metering and pricing policies. Wherever economically justified, meters should be installed and water deliveries measured. Where feasible, water and sewerage charges should be based on two considerations:
 - a. the costs that users impose upon the system, and
 - b. the costs imposed on society from the loss of the use of the resource for other purposes.Provision should also be made for recovery of unintended windfall benefits conferred upon affected properties by construction of facilities.
- 7-22. Where water is a scarce resource, States should investigate the legal and institutional feasibility of imposing withdrawal charges on self-suppliers of water diverting from surface and ground water sources as a means of improving efficiency in the use of water.
- 7-23. All Federal agencies that supply water to users should adopt a



Water services should be priced to encourage efficient use of water, but not to raise revenue beyond that required to recover costs.

uniform policy of cost-based pricing in all future water supply contracts, and, wherever practicable, extend that policy to classes of users who are not now charged.

*Section D. Transfer of Water Rights
Under Appropriation Doctrine*

CONCLUSIONS

Where resources are scarce, society cannot have all of everything it would like. Where scarce resources are diverted excessively into the production of certain things, it is done at the sacrifice of producing other things. Having too much of one thing means not having enough of another. To maximize returns to society, it is desirable that an optimum balance be struck.

In a mixed economic system as America's, where heavy reliance is placed on private action, the price mechanism of the marketplace is used to strike the balance. Goods and services in great demand command high prices and return large profits. The resources used in their production receive high returns and are bid away from alternate uses. On the other hand, products for which demand is poor or supply excessive receive low prices. Their producers suffer losses instead of profits. The resources associated with their production receive low returns and, where substitutability is possible, get bid away from production of relatively unwanted goods and services into the production of goods and services in greater demand. In this way, benefits to society are maximized. This is what is meant by the term "economic efficiency."

The Commission believes that much of the Nation's water supply, being a scarce resource, should be responsive to this kind of pricing mechanism so that it will not be inefficiently utilized for the production of things in superabundance but will be diverted instead into the production of things society craves more. Unfortunately, because of existing State and Federal laws and administrative procedures, there are impediments to the transfer of water rights from low-value uses to higher-value uses. This section has identified those impediments and has developed a set of recommendations designed to eliminate them or to reduce their adverse effect.

The Commission believes that implementation of its recommendations will facilitate voluntary agreements for the sale of water rights and for their reallocation to more valuable uses. If these recommendations are adopted and put into effect, the Commission believes it likely that construction of new water supply projects can be postponed in some areas for considerable lengths of time, that an economic incentive will be provided for saving water (since the amount saved will be able to be sold), that water will be put to better use so as to maximize the economic yield to society, and that, accordingly, the allocation of resources will be made more efficient.

RECOMMENDATIONS

Thirteen recommendations have been developed and described in detail in this section. The first two recommendations are designed to improve State water rights records, thus providing more and better information. The next four recommendations seek to simplify water transfer proceedings and, therefore, make them less expensive; and to give to purchasers of water the rights to the return flow generated by their new use thus to enable all of the transferred water to be put to more valuable uses. The next six recommendations are calculated to remove the uncertainties and complexities in Federal and State law concerning title to water rights. In effect, they will empower the actual user of water to make a sale of his water right so long as the rights of creditors, including the Federal Government, and of other water users are protected. Finally, the last recommendation urges that before any federally financed water supply project is submitted to Congress, there will be a report on the legal, institutional, economic, and physical feasibility of satisfying demand by the alternative of reallocating existing water supplies to new uses through the transfer of water rights.

In short, adoption of these recommendations will remove a number of significant impediments to the transfer of water rights. The Commission believes that the removal of these impediments will encourage such transfers and encourage greater efficiency and effectiveness in the use of the Nation's water resources.

- 7-24. Any water right not properly recorded 5 years from the effective date of the statute should lose its priority and should receive water only after all properly recorded water rights have been served.
- 7-25. The State engineer or any party with an interest should be permitted to apply in an administrative proceeding for the cancellation of any water right of record on grounds of abandonment or forfeiture. No such proceeding should affect a purchaser of such water right unless a notice of *lis pendens* (litigation pending) has been filed in the appropriate records office prior to the date the purchase agreement is entered into. The few States not having forfeiture statutes should enact them as part of this law.
- 7-26. All transfer proceedings should commence as administrative proceedings before the State engineer (or the equivalent water administration agency), who should be charged with the duty of making an independent determination of the adverse effect of the proposed change on junior appropriators. This determination may be based on his own investigations (given in a report to the parties), or on evidence presented by the parties, or both. The determination should be subject to judicial review but should be sustained if supported by substantial evidence.
- 7-27. An application for a transfer of a water right should be denied if the transfer would have the effect of substantially degrading stream

quality below the water quality standards existing at the time the application is made.

- 7-28. When it appears that the effect on junior appropriators from a change in point of diversion, or place or nature of use will be difficult to determine in advance of making the transfer, the State engineer should be authorized to issue a conditional order allowing the transfer, subject to further proceedings to modify the order so as to prevent such harm as might be proved in later proceedings. If it appears in the later proceedings that the harm sustained by the protesting junior appropriators is slight compared to the value in use after the change, the State engineer may deny specific relief, and transfer the case to the district court for the recovery of damages, including costs and reasonable attorneys' fees, by junior appropriators who have sustained harm.
- 7-29. After the effective date of the statute, all orders allowing the transfer of a water right should specify the new point of diversion, the amount of the new diversion in volume and rate of flow, the place and nature of the new use, its consumptive use, and, where feasible, the amount of return flow from the new use, and the point of its reentry into the system. Where the transfer order contains these specifications, the full amount of the water that has been permitted to be transferred should be the property of the new owner, including the return flow from the new owner's new use. Until the new owner fully uses or sells the return flow from the new use, other water users should be permitted to make interim use of such return flow, but the new owner should have the right to recapture the return flow when he (or his assignee) has a beneficial use for it and when it can be identified and segregated from other sources of supply and this should be stated in any State permit authorizing such interim use.
- 7-30. Congress should declare a national policy of permitting the transfer of water rights to more valuable uses through voluntary agreements and through the exercise of eminent domain powers as authorized by law. To that end, Congress should authorize the transfer of water rights, under which water is furnished to others by Federal agencies, without the consent of the Federal agency supplying the water provided, however, that the agency certifies that the financial obligations for the *construction* of the works have been repaid, and further subject to the provision of Recommendation 7-32 with respect to operation and maintenance costs.
- 7-31. Where a Federal agency is supplying water to users who have not repaid all the *construction* costs required to be repaid by water delivery contracts, the Federal agency should consent to the transfer of water rights in such supply if the United States is paid, by either the old or new owner, a lump sum equal to the amount of

outstanding construction costs allocable to the quantity of water transferred. Even in the absence of a lump-sum payment, the Federal agency should consent to such transfer if the new owner assumes the contractual repayment obligations allocable of the quantity of water transferred and if interest is paid on the amount from the date of the transfer at the rate specified for federally assisted municipal and industrial water supply as of the date of such transfer. This provision, too, is subject to Recommendation 7-32 on operation and maintenance costs.

- 7-32. Where a proposed transfer of water rights threatens to impair the ability of a person or organization to pay *operation and maintenance* costs when such person or organization is obligated by contract with a Federal agency to pay such costs, the new owner should have the right to assume an obligation to pay annually to such agency that portion of such operation and maintenance costs allocable to the quantity of water transferred.
- 7-33. Any user of water who has a contract for the use of such water, or whose right to the use is transferable with a parcel of land upon the sale of such land, should be entitled to sell his right to use such water and to apply for a change in the place or nature of use of such water in accordance with the law and procedures governing changes in points of diversion, nature, and place of use of water rights. In such proceeding, the applicant should not be required to prove ownership of an appropriation or permit right but should be allowed to transfer whatever right or privilege he may have, subject to the rule that such transfer shall not injure the rights of other water uses.
- 7-34. Upon the vote of a majority of the members of an irrigation district entitled to vote for members of the governing board, the district may enter into a contract for the sale of the water, or any portion thereof, to which it is legally entitled by contract or otherwise, and for its delivery to a purchaser at such place and for such nature of use as the purchaser shall designate, subject to the provisions of law regarding changes in the point of diversion, place, and nature of use. Except where individual users have voluntarily transferred their right to the use of water to the district, the diminution of supply available for use by members of the district by virtue of the transfer should be shared *pro rata* on the basis of average use over the 5 years preceding the date of the contract of sale. Without proof of more than a legal right to receive water, the district may apply for a change in the point of diversion, or in the place or nature of use, and a transfer of such right should be allowed, subject to the rule that the transfer shall not injure vested rights of others.
- 7-35. Each State having the appropriation system of water rights should provide for an administrative procedure for the transfer of such

rights by changes in point of diversion, place of use, and nature of use. Protection should be provided for the vested rights of other water users. Any person or organization having the right to use water should be entitled to transfer such right, and all statutes, judicial decisions, and administrative regulations to the contrary should be repealed.

- 7-36. Every report on a proposed water supply project submitted to Congress should include a study of existing developed water supplies in the general area of the project, the value of the water as presently utilized in the region, the estimated value in use of the supply to be developed by the projects, and the legal and economic feasibility of meeting the demand for the new supply by the transfer of water rights from the old uses to the proposed new uses. The report should contain a description of the water rights transfer law, procedures, and institutions, and an evaluation thereof in accordance with the recommendations set forth in this section.

Section E. Improvements in State Water Laws to Provide Recognition for Social Values in Water

CONCLUSIONS

State laws in many instances are inadequate to protect important social uses of water. Historically, the problem in the Eastern States has been that rights of "social" use of nonnavigable waters have been recognized only in private riparian landowners, with no public rights of either access or use. In Western States, the problem is that water has been diverted from streams to such an extent that instream values which should have been protected have been largely impaired, and in some cases, destroyed.

The Commission finds that certain legal reforms at the State level are necessary in order to realize optimum use of water resources in the public interest. Some States have taken an aggressive lead in revising their water statutes to recognize social values of waters, and they are to be commended.

The Commission recognizes that the States have different legal systems and doctrines, and that no single uniform statute will serve all States equally well. However, the public need for optimum use of water resources for recreation, quality improvement, scenic, and esthetic purposes, as well as for conventional economic values, is clear. Legal reforms are needed to accomplish that result.

The courses of action available to a particular State will, in large measure, depend upon the laws and organizational structure for water conservation and use within the State. Many problems deserve attention, including protection of natural stream channels from unreasonable alteration or relocation;

securing public access to some waters, beaches, shorelands, and wetlands; requiring public access rights to reservoirs or similar water facilities as a condition of public financing of water projects by State and local agencies; zoning ordinances to protect against development adjacent to water which would unreasonably detract from public use or natural amenities; and a broader test of navigability under State laws to extend public rights of use in more watercourses.

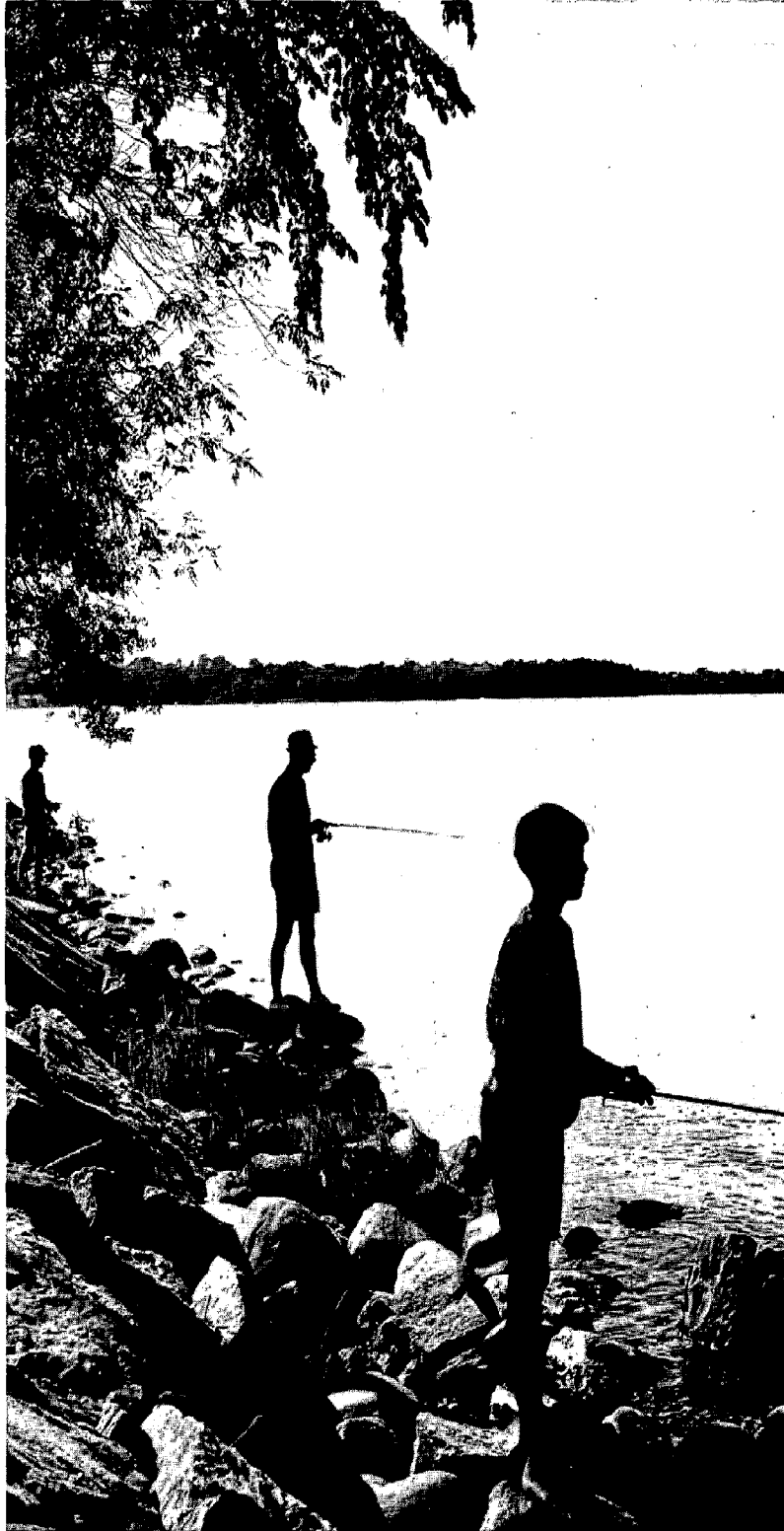
The Commission does not believe that every private water development should necessarily be made available for public recreation use. Many privately owned water facilities will have only nominal value for public recreation purposes or there may be adequate alternatives available. However, when privately owned water developments have exceptional recreational potential, a strong case can be made for provision of public access for recreation or for public purchase and development for that purpose.

The Commission commends those States that have taken steps to provide effective protection for noneconomic social uses of water, and encourages the remaining States to review their water laws and enact appropriate legislation without delay.

RECOMMENDATIONS

Beyond urging the States to proceed energetically to revise their water statutes so as to recognize social values of water, the Commission advances the following specific recommendations:

- 7-37. State property rules relating to water should authorize water rights to be acquired for all social uses, noneconomic as well as economic. In particular, recreation, scenic, esthetic, water quality, fisheries, and similar instream values are kinds of social uses, heretofore neglected, which require protection. As these values, and rights in them, are recognized and protected in natural lakes and streams, their benefits should be clearly mandated for general public use, particularly when they are uniquely suited to such uses.
- 7-38. Private social uses of water, for such purposes as boating, swimming, fish culture, and general recreation, should be authorized in appropriation States when water is diverted from natural watercourses for that purpose—but such rights should be granted only after a review is made to ascertain that such use will not constitute a substantial impairment of natural instream values susceptible to public use.
- 7-39. Public rights should be secured through State legislation authorizing administrative withdrawal or public reservation of sufficient unappropriated water needed for minimum streamflows in order to maintain scenic values, water quality, fishery resources, and the natural stream environment in those watercourses, or parts thereof,



Public right of access to water bodies should be provided by legislation, where necessary.

- that have primary value for these purposes.
- 7-40. State legislatures can and should liberalize their tests of navigability for purposes of the public trust, thus bringing more waters (as distinguished from shorelands) within the ambit of public use. States should take steps to assure public use of beds and shorelands of all navigable inland waters covered by the Submerged Lands Act which have a potential for such public use.
 - 7-41. Statewide outdoor recreation plans should include a review of beaches and shorelands to ascertain those areas that are in public ownership or subject to rights of public use; and, where public rights exist, measures should be taken to assure that public access is protected and public use regulated.
 - 7-42. Where wetlands are administratively or judicially determined to be State owned and have primary value for waterfowl propagation or other wildlife purposes, they should ordinarily be reserved or otherwise protected from drainage operations and developments which would destroy or substantially impair such values.
 - 7-43. Where there are no presently existing public rights of access and use of streams, lakes, and storage reservoirs, and where such areas are particularly valuable for public recreational use, the States should endeavor to purchase access easements for public use. In the Eastern States, these access easements ordinarily will be acquired in nonnavigable lakes and streams; whereas, in the Western States such easements more likely will be acquired in irrigation reservoirs and similar facilities that were constructed earlier for other purposes, are privately owned and operated, but which have important potential for fishing, boating, and related recreational pursuits.
 - 7-44. If access easements for public recreational use cannot be acquired by negotiation and purchase, then the States should authorize eminent domain to be exercised on a selective basis, as justified by public need.
 - 7-45. Whether easements for public access are acquired by negotiated purchase or condemnation, the Commission believes adequate provision should be made to assure that public use does not become unregulated public abuse. Those enjoying public access should be prevented from engaging in annoying conduct, littering, or other abuses which would detract from enjoyment of the area by other members of the public or interfere with the rights of adjacent landowners. An appropriate State agency should be charged with the specific responsibility of supervising public use of areas where access easements are acquired, including the installation of restroom facilities, providing garbage or refuse containers, and policing such public use areas with reasonable frequency and thoroughness.
 - 7-46. To assure that public use is properly controlled, or to assure that

adjacent landowners are protected if public use is not properly controlled, the States should consider (1) authorizing compensation to landowners in the event they suffer damages from public misconduct, (2) creating buffer zones between areas open to use by the public and privately owned adjacent lands, and (3) including conditions or restrictions within access easements to provide reasonable landowner protection—and making these provisions specifically enforceable by the landowners.

Section F. A Permit System for Riparian States

CONCLUSIONS

This section sets forth principles the Commission believes to be sound guides in the formulation of a permit statute to regulate withdrawal of water for municipal, industrial, agricultural, and other beneficial use in States that follow the riparian doctrine of water rights. The proposed permit system departs from model codes and statutes currently in force by placing greater reliance on market forces to reallocate water to more productive economic uses. It also differs in establishing two levels of minimum streamflow: (1) essential minimum flow that cannot be impaired by man's withdrawals and (2) desirable minimum flow that would not be subject to diminution by permits issued after the statute took effect but could be invaded in periods of drought to supply prepermit uses.

The Commission does not recommend the immediate enactment of a permit statute in every State not presently having one. It costs money to acquire the information required to operate a permit system properly, and those costs should not be incurred until scarcity and competition warrant the expense. However, it is not too early for legislatures to begin examination of their State's water situation, for it is highly desirable to establish a clear and definite legal system of water rights before an emergency arises. There is merit in early enactment of a permit statute that may be applied on a basin-by-basin basis, as the need arises.

RECOMMENDATIONS

The essential elements of the permit system which the Commission recommends for consideration by the riparian States are the following:

- 7-47. Permits should be required for all withdrawals of water, whether the use was initiated before or after enactment of the statute and whether the source of supply is surface water or ground water. Exceptions can be made for withdrawals of inconsequential amounts of water. Upon application filed within 5 years of the effective date of the act, a permit shall be issued for any use initiated prior to the

enactment of the statute.

- 7-48. There should be no restrictions on who may apply for a permit or on the location where water may be used.
- 7-49. Permits should contain full information on (a) source of supply, (b) point of diversion or well location, (c) place, nature, and time of use, (d) volume and rate of withdrawal, and (e) amounts of consumptive use and return flow, and, if practically ascertainable, point of reentry to the hydrologic system of return flow.
- 7-50. Permits should be subject to cancellation after a specific period of nonuse.
- 7-51. Permits may be limited in time, but the initial period should be long enough for the permittee to amortize his investment comfortably, and renewal of the permit should be automatic unless the permit agency finds the water is necessary for a higher public purpose.
- 7-52. An administrative agency should be delegated authority to establish minimum streamflows and lake levels in accordance with standards that include consideration of (a) public health, (b) ecological values, (c) recreational use, (d) esthetics (including private investment in scenic values), and (e) alternate values of the water in municipal, industrial, and agricultural use.
- 7-53. Definite rules for allocating water in periods of shortage should be adopted before shortages occur. States should consider an allocation system (a) that would make all permits for uses initiated after enactment of the statute subordinate to permits for uses initiated before the statute and (b) that would distribute water to poststatute uses in order of temporal priority.
The statute might also provide that, subject to the preservation of essential streamflows and lake levels, prestatute uses would share available supply *pro rata* in times of shortage.
- 7-54. Permits should be freely transferable to promote the reallocation of water to more productive uses, subject to the restriction that a transfer should not injure other permittees or impair minimum streamflow or lake levels.

Section G. Reducing Water Losses by Improved Efficiency

CONCLUSIONS

Substantial savings can be made through improved efficiency in the use of water for irrigation. The Commission was impressed by the University of Arizona's demonstration of trickle irrigation in an enclosed environment system at Puerto Penasco, on the Gulf of California in Sonora, Mexico. This is a costly system, but it can show the way toward vast improvements in

irrigation water use in the future. Other, and less exotic opportunities for improved efficiency abound. For example, a statement submitted to the Commission by the Utah-Idaho Sugar Company at its public conference in Spokane indicates that that company achieved substantial reductions in water use when it switched in the early 1960's from gravity-flow irrigation to sprinkler irrigation on its Osgood Project in Southeastern Idaho. The U-I Osgood Project consists of approximately 6,000 acres of irrigated land and is not a Federal Reclamation project. Prior to the change to Sprinkler irrigation, the Commission was told, the project had been "water hungry." After the change, which included squaring up fields and other modernizations, an additional 1,000 acres of land could be put under irrigation and the usage of water per acre for irrigating crops was cut in half.

It must not be assumed, however, that all irrigation water in excess of consumptive use is lost to the system. In many cases, perhaps most cases, the water is returned to the streams as streamflow or serves to recharge ground water. Some excess water is needed in almost all irrigated areas to leach salts from the soil. But in those cases where the return flow reaches the ocean or a saline lake, either as surface or ground water, improved efficiency can save water for other uses.

In most cases, what is lost through poor efficiency is water in storage which may prove a useful reserve against subsequent drought, or the value of the water by reason of location, timing, or quality. The return flows will occur farther downstream where there may be less favorable options for use. The return flows will occur later—sometimes several months later—when the water may be less valuable. The return flows will also contain more salts which may diminish their utility. Finally, if the excess water is added to the ground water, costs will be incurred in pumping it to the surface for use. Thus, while improved efficiency may not "save" large quantities of water, it may protect the value of the water. Each basin poses its own special conditions and the values gained from better management must be determined by a study of each basin.

The Commission believes that a number of useful steps can be taken to achieve water savings and has prepared specific recommendations on irrigation and municipal use.

RECOMMENDATIONS

Irrigation Use

- 7-55. The States in water-short regions should enforce existing laws to limit water use to beneficial need, and thus prevent wasteful application of water and unreasonable transmission losses.
- 7-56. The appropriation States should quantify "beneficial need" and "reasonable efficiency" for particular areas in order to reduce water waste.

- 5-57. States in water-short areas should adopt doctrines and procedures to encourage voluntary actions to improve efficiency of water use. Specifically, rights should be created in salvaged water, and the rights should be freely transferable to other uses and users, subject only to the limitation that rights of others should not be injured.
- 7-58. Irrigation water rate structures should be designed to encourage efficient, rather than excessive, water use.
- 7-59. Water supply projects should not be authorized by the Congress until evaluations are made with respect to the efficiency of use of presently developed supplies in proposed project areas, and until a report is made on the prospects and desirability of satisfying existing shortages in any particular area by water-savings practices in lieu of further project development.
- 7-60. Effective leak control programs should be instituted and meters to measure individual water use should be installed by water supply agencies in urban areas.
- 7-61. Water prices and sewer charges for individual service should be set at levels which fully cover the costs of amortizing and operating the facilities necessary to provide these services, and a municipal water supply rate structure should be adopted which encourages intelligent, rather than excessive, water use.
- 7-62. Amendments to plumbing codes should be adopted, requiring the installation of water-saving fixtures and appliances in all new construction, and whenever existing water-using appliances or fixtures are replaced.
- 7-63. The water supply should be managed to accommodate sequential uses of water, such as using effluent from treatment plants for irrigating parks and golf courses and for industrial use within the area; and irrigation uses should be timed to coincide with low water-demand periods to conserve reservoir and pipeline capacity.
- 7-64. A public relations program should be conducted to encourage wise water use, pointing out to consumers the benefits to the city and its inhabitants to be realized through conserving the water supply.

Section H. Reuse of Municipal and Industrial Wastewater

CONCLUSIONS

The potential for reuse of treated municipal and industrial wastewater is considerable; the prospects are encouraging. The technology of reuse already provides important savings. Extension of the technology can be expected to yield significant gains in water conservation. The subject merits careful and serious consideration.

Table 7-5 indicates that after secondary treatment municipal wastewater can be brought to the chemical equivalent of drinking water quality at a cost of about 36 cents per 1,000 gallons for a 10 m.g.d. plant. This is a relatively high cost even in areas of the country where water is scarce. However, the actual net cost of treating for reuse could be much less because of pollution control requirements that will be imposed anyway and also because some of the advanced treatment processes involved probably will be required for any alternative supply sources as well.

This suggests that the future of advanced waste treatment, insofar as conserving water resources by reuse is concerned, is very real but that the degree of its employment will vary from one situation to another depending on location, needs of the time, and type of use. Industrial direct reuse can proceed on the basis of present technology, as can ground water recharge and recreation use. Ultimately, potable supplies from wastewater could be and probably will be made available for direct reuse.

Treatment up to and including the secondary phase, or even including the relatively inexpensive step of removing suspended solids, will be adequate for many industrial uses and for such uses as golf course irrigation. In these cases, the costs above the requirements for pollution control will be very small.

Reuse of treated municipal and industrial wastewater should reduce the demand for new sources of water.



Reuse may have to be accompanied by some demineralization in those cases where dilution with other supplies fails to produce a supply adequate to the needs of particular uses.

Removal of nutrients and suspended solids from wastewater has been utilized to provide water for recreational boating and fishing. Disinfection added to this procedure will provide water that can be used in contact with humans (in such sports as swimming and water-skiing), provided research leads health officials to conclude there are no significant health hazards.

The present procedure of a continuum of treatment steps, from lower to higher levels of treatment in sequence, is a logical outgrowth of existing technology. However, it is not the only, nor will it necessarily be the best, course to pursue. Recent experimental work in which parts of primary, secondary, and advanced treatment are combined offers considerable promise for the future. Although this combined-phase technology has already been developed and seems ready for full-scale operations, it has not yet been incorporated into a full-scale plant.

RECOMMENDATIONS

- 7-65. The potential for reuse of wastewaters should occupy a prominent spot in future planning for overall water resources utilization.
- 7-66. The Commission believes that direct reuse of water for industrial purposes and that indirect reuse for purposes of human consumption will increase. Where feasible, such indirect reuse should be minimized by limiting wastewater reuse to processes that do not involve human consumption. This will have the effect of releasing for human consumption potable water now being used by industry. However, previously demonstrated successes in protection of public health in instances where municipal water supplies are derived from indirect reuse suggests that increases in such indirect reuse for human consumption should not be discouraged.
- 7-67. In regions where a high-quality source of water is used for irrigation of cropped fields or recreation turf areas such as golf courses and a source of treated municipal wastewater is available, arrangements for water exchange should be considered. Nutrient-rich municipal wastewater could be used for irrigation and exchanged for high-quality water which could be used for domestic and industrial use.
- 7-68. Direct reuse of water for human consumption should be deferred until it is demonstrated that virological and other possible contamination does not present a significant health hazard. Further knowledge on this subject is necessary, and the Commission endorses the research program recommended by the American Water Works Association, as follows:
 - "1. Identify the full range of contaminants possibly present in treated wastewaters, which might affect the safety of public

health, the palatability of the water, and the range of concentrations.

- "2. Determine the degree to which these contaminants are removed by various types and levels of treatment.
- "3. Determine the long-range physiological effects of continued use of reclaimed wastewaters, with various levels of treatment, as the partial or sole source of drinking water.
- "4. Define the parameters, testing procedures, analytical methodology, allowable limits, and monitoring systems that should be employed with respect to the use of reclaimed wastewaters for public water-supply purposes.
- "5. Develop greater capability and reliability of treatment processes and equipment to produce reclaimed water of reasonably uniform quality, in view of the extreme variability in the characteristics of untreated wastewaters.
- "6. Improve the capabilities of operational personnel."

The Commission also recommends that research focus on advanced treatment processes that incorporate or replace secondary treatment, on other methods of reducing the cost of advanced treatment, and on the practicability of installing and operating dual water supply systems—one for human consumption and the other for manufacturing purposes.

- 7-69. The net cost of treatment of water for reuse should be compared with the costs of such alternative sources of water as desalting and interbasin transfers before any such alternative is adopted.

CHAPTER 8. INTERBASIN TRANSFERS

CONCLUSIONS

Proposals for physical transfers of water from one watershed to another abound. As economic demand for water increases, as available water supplies in areas of shortage shrink, as technological capability improves, and as national income grows, the feasibility of interbasin transfers increases and the scale of proposals grows larger.

Congress has the power either to prohibit or to require an interstate, interbasin transfer. The ultimate decisions as to criteria for design, construction, review, benefited areas, repayment, protection for areas of origin, environmental safeguards, and other aspects of such interbasin transfers are all Congress's to make.

Sound economic criteria should govern the disposition of water which is available for economically useful purposes. The Commission concludes that proposed interbasin transfers should be planned and evaluated in accordance with three economic criteria.



Direct beneficiaries of interbasin transfers who can be identified should be obligated to repay reimbursable costs with interest.

First, a proposed project should be the least-cost way of securing a given supply of water. Second, the benefits generated by the transfer in the receiving area should exceed the full costs of the transfer *plus* the net benefits which that same water would have generated in the area of origin. And third, the net productivity of the project should be compared to that of alternative investment opportunities.

Direct beneficiaries of an interbasin transfer who can be identified and reached should ordinarily be obligated to repay with interest the full project costs allocable to the purposes from which they benefit, including compensation to the area of origin for the costs of foregone opportunities occasioned by the water transfer. If these economic standards and repayment criteria are met, interbasin transfers will make an optimum contribution to the Nation's economic well-being; water will be employed in its most productive uses and the cause of economic efficiency will be served.

In computing benefits of an interbasin transfer, consideration should be given not only to the foregone opportunities which will be suffered in the exporting area, but to resulting offsets in other regions as well. If an interbasin transfer increases production in an importing area which, in turn, results in reduced production elsewhere in the Nation or requires larger farm subsidies than would otherwise have to be paid, net benefits will be reduced and the feasibility of many proposed interbasin transfers will be lessened.

Unless it is economically feasible, interbasin transfers should not be undertaken to rescue areas which are mining ground water, that is, which are depleting ground water reserves by pumping in excess of recharge.

In the final analysis, it is Congress which must exercise decisionmaking responsibilities with respect to interbasin transfers. The economic criteria which the Commission advances cannot and should not be binding on Congress. They are intended only to assist Congress in making its decisions. Congress can, if it chooses, reject interbasin transfers that appear sound and authorize transfers that do not. Whatever it does, however, Congress should have available to it project evaluations based on the criteria recommended here, so that the decisions it makes will be made with full awareness of the social and economic consequences.

Because there is no market mechanism for pricing the export of water resources from one basin to another, some means must be devised to protect areas of origin from losses they may suffer as a result of water exports. The Commission concludes that "in kind" area-of-origin protections which limit exports to "surplus" waters, or seek compensating storage, or provide for recapture, or attempt to predict "ultimate requirements," "adequate supply to meet beneficial needs," and other equally ethereal concepts, are inappropriate. Such "in kind" protections are certain to produce excessive and unnecessary controversy and, even worse, they are likely to produce bad economic results as well. The Commission concludes that area-of-origin protection should be based on the anticipated losses suffered by the

exporting region. The debate on area-of-origin protection which will accompany consideration of any major interbasin transfer should focus on compensating the area of origin for losses resulting from the transfer. The indemnification which is fixed as appropriate compensation to areas of origin should properly be included in project costs and be subject to full recovery from beneficiaries the same as other project costs.

Finally, the Commission concludes that existing institutional arrangements for development of water projects in general and interbasin transfers in particular are unsatisfactory. At present, the Federal agencies responsible for the design, construction, and operation of water resource projects, primarily the Corps of Engineers and the Bureau of Reclamation, are also responsible for evaluating those projects. Questions about the objectivity of the evaluation necessarily arise, for the appearance of impartiality is lacking, whatever the facts may be.

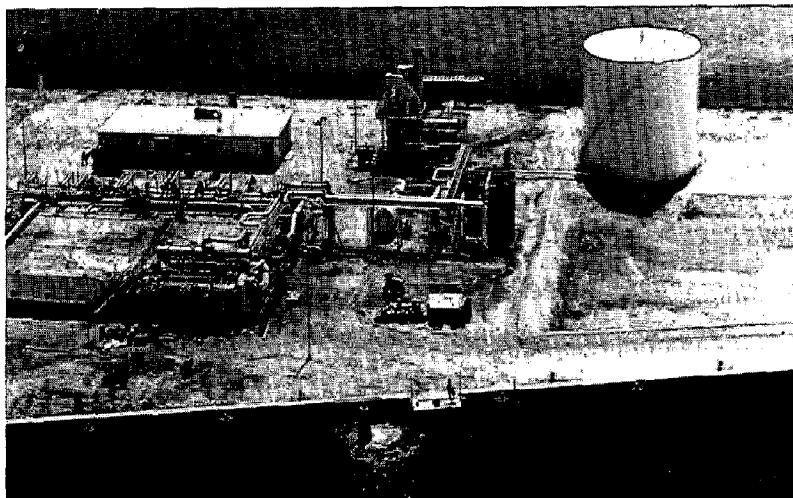
The Commission sees no reason why water resources planning functions now vested with the design and construction agencies and with other planning entities should not remain where they are. What is desired is to separate project evaluation, on the one hand, from planning, design, construction, and operation, on the other, so that Congress and the public can have the benefit of impartial evaluations. The Commission concludes that the best way to do this is to vest the project evaluation function in the hands of an independent Board of Review. If this is done, existing legislation prohibiting the study of interbasin transfers can properly be repealed.

RECOMMENDATIONS

- 8-1. As part of an act repealing existing laws which prohibit the study of interbasin transfers, Congress should declare the following economic criteria to be applicable to the planning and evaluation of interbasin transfer proposals by Federal agencies:
 - a. An interbasin transfer proposal should be the least-cost source of water supply to serve a given purpose, and all feasible alternative sources of supply should be examined and evaluated on the same basis. In comparing alternatives, due attention should be given to projected technological developments.
 - b. The value of the water in the new uses should exceed the aggregate of the value of the water in the uses to which it would have been put had it not been exported, plus the costs of constructing and operating the interbasin transfer project.
 - c. The net economic gains anticipated to accrue from the transfer project should be stated and compared to the gains that might be expected to accrue from alternative investment opportunities.
 - d. An increase in regional economic development attributable to a proposed interbasin transfer should not alone serve to justify

the proposal. The project should result in national economic development, that is, in net economic gains in benefited areas which more than offset resulting net economic losses in other areas of the country.

- 8-2. Directly affected States should seek to reach agreement among themselves and with the Federal Government by Federal-interstate compact prior to submitting an interstate, interbasin transfer proposal to Congress.
- 8-3. It should be the national policy to require the direct beneficiaries who are identifiable to pay the full reimbursable costs of an interstate, interbasin transfer project, including compensation to the area of origin for the present worth of the net benefits foregone as a result of the export of water. To effectuate this policy, Congress should enact legislation which embraces the following principles:
 - a. The beneficiaries of a project should pay the total reimbursable costs of construction as those costs ultimately materialize, plus the reimbursable operation and maintenance costs. The repayment period should not exceed the economic life of the project works, and interest should be charged on the unrepaid investment at a rate not lower than the cost to the Federal Government of long-term borrowing at the time of construction. Some project costs, such as costs of construction in and compensation to the area of origin, should be allocated among benefited State and local governments in proportion to the benefits each receives. Other project costs, such as costs of canals, aqueducts and pumping in receiving areas, should be allocated to each benefited State and local government in proportion to the actual expenses incurred in bringing water to each (i.e., areas farthest from the area of origin or at higher elevations requiring additional pumping should be obliged to bear a proportionately greater share of such costs). In turn, benefited State and local governments should assess individual direct beneficiaries in proportion to the project costs attributable to each. Since benefited localities can be easily identified it is expected that virtually all costs of an interstate, interbasin transfer will be reimbursable. Costs should be deemed non-reimbursable only when they cannot be properly assigned to States or subdivisions thereof.
 - b. Areas of origin should receive monetary compensation for net losses incurred as a result of the transfer. The amount of such compensation will be determined by Congress after consideration of estimates furnished by the area of origin, the beneficiaries of the project, and the Federal agencies involved in the planning and evaluation of the project. Direct beneficiaries of



Desalting will play a significant future role in the United States in meeting increasing future water demands.

the project who are identifiable should be required to pay their share of these costs as part of the reimbursable costs of the project.

- 8-4. Evaluation of an interstate, interbasin transfer proposal in accordance with the criteria set forth here should be the responsibility of the independent Board of Review recommended in Chapter 11, Section B.
- 8-5. All interbasin transfer proposals should be carefully evaluated in accordance with environmental legislation in force at the time the proposal is made.

CHAPTER 9. MEANS OF INCREASING WATER SUPPLY

CONCLUSIONS ON DESALTING

Because of increasing future water demands and relatively fixed natural supplies of water, it is likely that desalting will play a significant future role in the United States. This applies especially to the use of smaller desalting plants, less than 10 million gallons per day (m.g.d.) capacity, in areas where other supplies are costly, where there are natural supplies of brackish water, where existing supplies need to be upgraded, or where point-sources of dissolved solids can be treated. There probably will be significant opportunities also for plants of up to 50 m.g.d. or larger as an incremental supply or for intermittent and conjunctive operation with existing surface and ground water sources. Large plants in the 50 to 250 m.g.d. range offer promise for desalting sea water primarily at this time through dual-purpose technology (e.g., desalting and power production), but the extent of this potential cannot be established without prototype experience. Still larger

Precipitation augmentation techniques have potential for increasing water supplies.

dual-purpose power generation and desalting plants up to 1,000 m.g.d. in size have been considered and analyzed for irrigation and industrial purposes, but they involve still greater uncertainties. Desalting projects using energy from outside sources are becoming less and less attractive as the cost of energy increases. They are only really attractive when they utilize or make possible the more efficient use of waste heat that might otherwise be lost, or a source of natural heat such as geothermal or solar energy.

There are certain policy matters relating to the future course of the Federal effort in any national desalting program. The first is whether the basic desalting processes are sufficiently developed so that private industry can assume most of the future research and development costs for small-sized plants. Many of the processes are now in commercial production and the Commission believes that desalting research and development is far enough advanced to eliminate the most important design, construction, and operational risks for desalting plants smaller than 10 m.g.d. using the distillation process but that important improvements in the reverse osmosis and freezing processes may occur and research in these areas should continue.

The Commission believes that federally sponsored research and development on small desalting plants (less than 10 m.g.d.), except for the reverse osmosis and freezing processes and for other processes needed in connection with large plant development, should be gradually eliminated over a 3-year period. The Federal research and development effort should be continued with respect to development of larger desalting plants and multipurpose desalting plants.

The second policy matter concerns the magnitude of the Federal Government's desalting research program as that program relates to other Federal research programs. In recent years, the U.S. Office of Saline Water (OSW) program has been on the order of \$27 million annually. About half of this was for demonstration purposes. The OSW program has been about double that of the Office of Water Resources Research (OWRR) (also in the U.S. Department of the Interior) and about four times the Bureau of Reclamation's program of research in precipitation modification. The level of funding for research and demonstration by OSW appears appropriate. Any disparity between OSW and OWRR with respect to available funds would seem to reflect a deficiency for OWRR rather than an excess of funding for desalting.

Third, there should be some reshaping of the desalting program. There is need for more study relating to the application of desalting to other supply sources—desalting for interim use or in staged developments and for conjunctive uses. There also is need to give detailed study to the use of interruptible energy for desalting purposes. Applications of desalting to environment improvement will play an increasingly important role as



wastewater criteria become more severe. Research and development to improve the capability to meet these requirements should continue.

A fourth matter is that of the proposed prototype program. While the Commission endorses the concept of Federal assistance for a large prototype desalting plant for research and development, it has some apprehension that the precedent might be used to justify Federal funds for other large plants to follow. While it is possible that future developments in carefully selected instances where private capital will not be made available might justify some Federal support, the Commission's endorsement at this time is limited to one large prototype plant.

RECOMMENDATIONS

- 9-1. The basic research and development program of the Federal Government for desalting plants in the size range up to 10 m.g.d. should be largely phased out within the next 3 years. The Federal Government should retain a research and development interest in small desalting plants only for the freezing and reverse osmosis processes and for other processes not commercially proven which will be needed to foster development of large plants. The research and development program for larger desalting plants and for multipurpose applications should continue to be federally supported.
- 9-2. The Federal Government should provide a grant to aid in the construction and operation of one large prototype desalting plant when the technology has been developed adequately and where there is a clear requirement for the water produced. The amount of such Federal assistance should be limited to the residual uncovered costs of the project after power supply and water supply entities which will be direct beneficiaries of the project have contributed amounts equivalent to the lowest cost alternative power and water supplies which they would otherwise be obliged to pay for in the absence of the prototype facility.

CONCLUSIONS ON PRECIPITATION AUGMENTATION

The Commission concludes that precipitation augmentation has potential as a technique for increasing future water supplies. The technique will probably be limited initially to certain areas of the Nation and to certain times of the year. But insufficient information is known at present to develop a comprehensive national policy with respect to this technology.

RECOMMENDATIONS

- 9-3. Research on precipitation augmentation should continue with emphasis not only on increasing rainfall and snowfall propitiously,

but also on means of determining the effect on usable water supplies and on downwind and side effects, particularly those having economic, environmental, or ecological consequences.

- 9-4. Development of comprehensive Federal policy on precipitation augmentation should wait until results of current research develop better information on (1) operational capability, (2) side effects, and (3) the extent of regulation needed. When adequate research results are available, Congress should consider regulatory and other policy legislation.
- 9-5. The Act of December 18, 1971, under which the Secretary of Commerce has promulgated rules and regulations for reporting on all weather modification activities should be made applicable to Federal agencies. This could be accomplished by an executive order.

CONCLUSIONS ON LAND MANAGEMENT

A practical potential exists for increasing or otherwise improving water supplies by application of appropriate land management techniques. Adroit management of land resources can, in some cases, simultaneously yield increased water supplies (because of less evapotranspiration) and increased usefulness of supplies (by delaying or stretching out runoff) without harmful environmental effects. The Commission concludes, however, that increasing water yield is inappropriate where it requires eradication of native vegetation and threatens the extinction of endangered species of wildlife.

RECOMMENDATIONS

- 9-6. The Congress and the President should direct Federal agencies having land management responsibilities to give adequate consideration to water yield as an objective of multiobjective land management plans.
- 9-7. Local non-Federal water management agencies, whose constituents would benefit from an increase in water supplies derived from land management practices, or public and private landowners who would benefit, should finance the additional cost of those management practices which are attributable to the water supply objective.

CONCLUSIONS ON POTENTIAL TECHNOLOGY

Each of the technologies identified above by the National Academy of Sciences' Committee on Technologies and Water would have to be carefully investigated for possible adverse environmental effects and should only be undertaken if the net benefits appear substantial, if the technology is the least-cost alternative, and if environmental standards can be satisfied.

In addition to these potential technologies for increasing water supply which have been suggested by the National Academy of Sciences, the investigation of potential technologies for decreasing water demand may also

yield significant benefits. Application of research to ways in which industrial and other processes can be changed in order to effect substantial reductions in the amount of water required per unit of output or per unit of raw material processed could yield significant economic and environmental benefits by reducing the total quantity of water necessary to produce the quantity of goods and services demanded by society.

CHAPTER 10. BETTER DECISIONMAKING IN WATER MANAGEMENT

Water Resources Planning

RECOMMENDATIONS

- 10-1. If Congress enacts legislation to establish a program of Federal grants to States for improving State land use planning, it should make adequate provision in that legislation for the coordination of water and land use planning at the State, Federal, and local levels, and should encourage the use of coordinating institutions, such as the Title II river basin commissions, where they exist.
- 10-2. The Water Resources Planning Act of 1965 should be amended to open the present program of water resources planning grants not only to the States, but to local, intrastate planning entities as well.
- 10-3. The Water Resources Planning Act of 1965 should be amended to provide for the establishment of Federal-State-local planning organizations for areas where there is a distinct Federal interest and where such organizations may be needed to provide more intensive and continuing attention to the water management needs of smaller basins or metropolitan planning areas.
- 10-4. In appropriating funds for future water resources and water quality planning, Congress should provide for coordination with the plans and programs of the established Federal-State river basin commissions and the Water Resources Council. Congress should appropriate larger amounts under the Water Resources Planning Act for support of State water planning.

The Role of the Public in Water Resources Planning

RECOMMENDATIONS

- 10-5. As provided in the Water Resources Planning Act, the Water Resources Council (WRC) with the approval of the President should:
 - a. Direct Federal water resources planning agencies to adopt procedures and issue appropriate directives and guidelines to field entities to provide opportunities for broad public participa-

tion in water planning activities from the inception of the planning process on.

- b. Monitor public participation in interagency planning by reviewing the adequacy of provisions for public participation.
- 10-6. As as prerequisite to project authorization, Congress should require Federal water resource agencies to report to it on public participation with respect to particular projects, showing compliance with agency public participation procedures, describing the questions considered and the viewpoints expressed, and providing supporting information for the decisions reached on controverted points.
- 10-7. Water resources planning agencies should structure their planning procedures so as to proceed promptly to resolution of issues and to conclusions, even though consensus is impossible, by scheduling the timing of public participation and defining the issues to be addressed. Agencies should not place excessive or sole reliance on formal proceedings, but should supplement the formal proceedings both before and after recommendations are made with informal meetings with interests affected by the proposal.
- 10-8. Water resources planning agencies should help compensate for the lack of resources of some participating publics (a) by providing timely, well-publicized information with respect to (1) opportunities to participate, (2) alternative courses of action, (3) the course of action favored by the planning agency, (4) benefits and costs, and (5) other relevant factors; (b) by scheduling at least one public hearing in the area of the proposed project; and (c) by making basic data, reports and other background information readily available to the public.
- 10-9. Federal and State governments should require advance public disclosure, as soon as feasible, in the preclicense planning of major non-Federal projects expected to have an impact on water resources (i.e., where a permit eventually will be required for the water use and where issuance of the permit is subject to a determination that it will serve the public interest).
- 10-10. Where conditions indicate, licensing agencies should seek to develop the interests of all those publics who are affected by agencies' decisions. Where it is determined that some publics are not adequately represented in licensing proceedings, licensing agencies should use independent public advocates to represent such interests, including environmental and consumer interests.

Evaluation as a Basis for Decisionmaking

RECOMMENDATIONS

- 10-11. The President should approve the substance of the principles and standards of multiple-objective planning, as proposed by the Water

Resources Council, with the exceptions noted below with respect to the discount rate and the principle of effective economic demand.

- 10-12. The principles and standards which are adopted for the evaluation of Federal water resources projects should include the principle that benefits for water resources development projects be derived by applying the concept of effective economic demand. This principle and the procedures it entails for implementation should be included as an amendment to the principles and standards proposed by the Water Resources Council. Care should be taken that the information used in the evaluation of water resources projects reveals fully (1) both the positive and negative effects of proposed projects upon all local interests and (2) any important positive and negative effects upon other regions.
- 10-13. The discount rate for evaluation of water resources projects should be established by the Treasury Department based on the average yield rates of outstanding long-term Treasury obligations. The discount rate should remain constant for a period of five years and then be recomputed.

Authorization, Budgeting, and Appropriations

RECOMMENDATIONS

- 10-14. Comprehensive river basin and regional development plans should be used as the basis for authorization and appropriation of funds for individual projects and programs within regions. The same geographic regions should be used as a basis for decision in both the water resources planning and in the budgeting processes—the major water resource regions of the Nation used by the Water Resources Council in the National Assessments.
- 10-15. The procedure for appropriating construction funds annually for ongoing water resources projects should be replaced by a procedure whereby a permanent appropriation of the estimated total construction cost of each project is made at the time construction of the project is to begin.
- 10-16. Where grant programs are authorized to assist State and local entities in meeting national objectives, appropriate Federal program administrators should be given contract authority to obligate the United States, in advance of appropriations if necessary, to pay the full authorized Federal share of the cost of meeting such objectives.
- 10-17. Each water agency should each year formulate a five-year program including a continuation of existing projects and new construction projects for submission to the Office of Management and Budget. The President should formulate and recommend to the Congress five-year national budget allocations for the total Federal water

program. In his budget recommendations to Congress, the President should emphasize regions as well as individual water projects and organizational accounts.

- 10-18. Water resource programs, projects, or separable units thereof, which have been authorized for a period of ten years or longer and on which construction starts have not been made, should be deauthorized by Congress. No funds should be appropriated to start any project or program authorized for more than five years until it has been reevaluated and found feasible under principles and standards in force at the time of the proposed appropriation.

CHAPTER 11. IMPROVING ORGANIZATIONAL ARRANGEMENTS

Section B. Federal Coordination and Review

CONCLUSIONS AND RECOMMENDATIONS ON THE WATER RESOURCES COUNCIL

The Water Resources Council has become an important and useful mechanism. However, a number of improvements need to be made to help it carry out the mandates and achieve the goals of the Water Resources Planning Act. The Council seems most weak in its ability to review the policies and programs of the Federal agencies, to confront policy questions and resolve them, and to resolve interagency conflicts. The Council needs a policymaking component, with an ability to enforce decisions when consensus cannot be reached. Implementation of the following two recommendations through appropriate legislation would help to build this policymaking component into the Council mechanism.

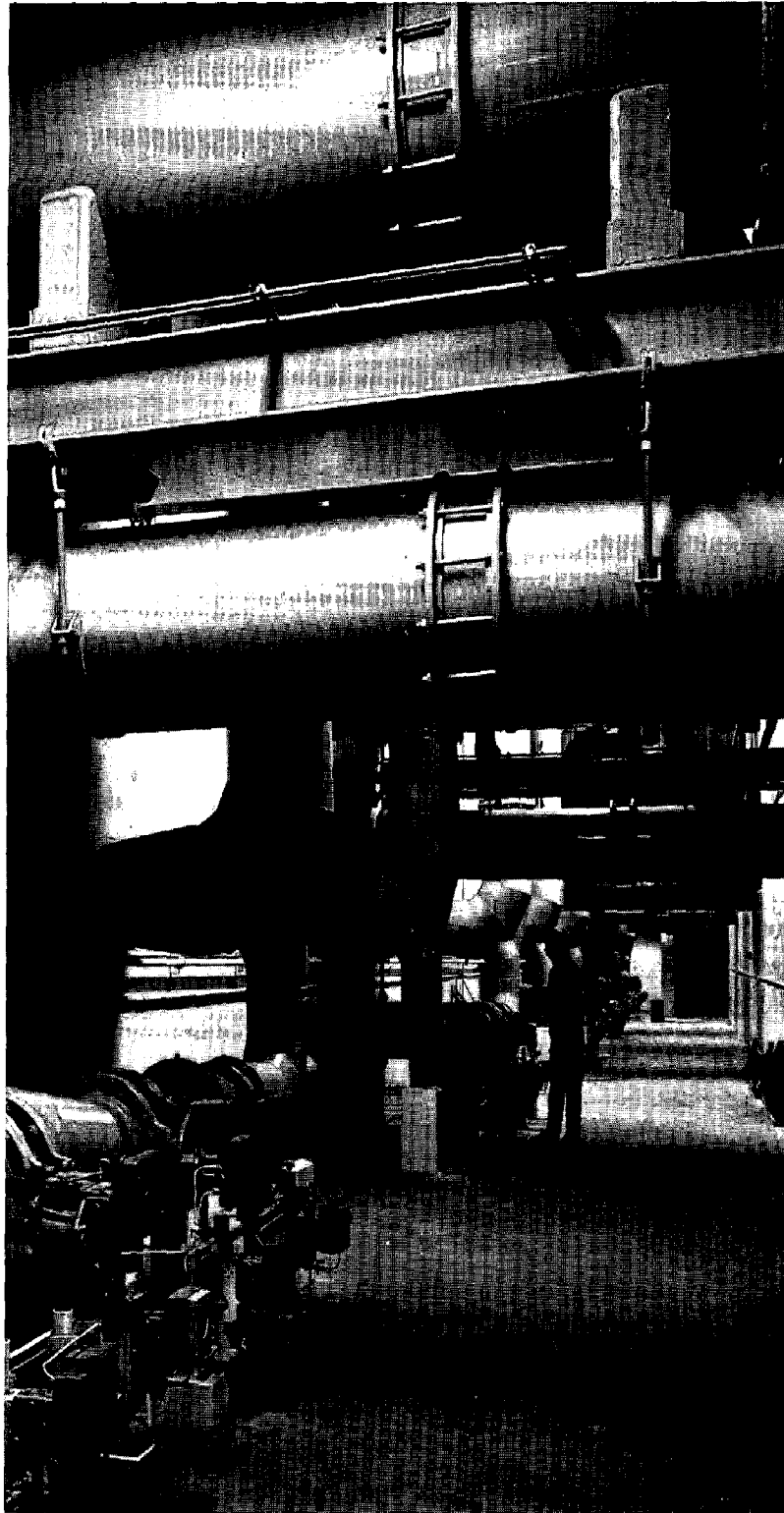
- 11-1. The Water Resources Council should have an independent, full-time chairman; he should be on the White House Staff and report directly to the President; the Council should be placed within the Executive Office of the President.
- 11-2. Each Water Resources Council member should be represented by a qualified employee from the member's department or agency; the representative should serve on the Council of Representatives and should report within his department or agency directly to the Water Resources Council member or to his alternate.

First, an independent and full-time chairman on the White House Staff, with his own staff and with presidential support, should be able to inject a national and presidential viewpoint into Council matters. Adequate presidential support for the independent chairman is a key ingredient. The independent chairman should be in charge of the Council's budget and not need to have the budget approved by the other Council members, although he might wish to consult them. He should be able to innovate, attack the

controversial problems, resolve interagency conflicts, and keep mission-oriented agencies in the COR from dominating Council activities and from limiting efforts in controversial areas. He could direct the submission of issues to the President for decision when necessary. His power to do so probably would mean that the power would not need to be used frequently, and the President thus should not be overburdened with water resource matters. A full-time, independent chairman would not have to devote most of his energies to other matters as the present and past chairmen have had to do. He would give continuity to the Council despite changes in cabinet officers. He would avoid the competing interests between the present chairman's dual roles as head of the Council and of a separate department of the government. In addition, an independent chairman would provide convenient support for members of the Council against pressures from bureaus in their agencies when such bureaus feel affected adversely by a Council decision. He would also provide liaison between the White House and presidentially appointed river basin commission chairmen.

An independent chairman on the White House Staff would be more influential with the Office of Management and Budget (OMB) in the area of water policy. OMB for many years has played, and will certainly continue to play, an important role in water resources policy. Executive Order 9384 of October 4, 1943, charged the Bureau of the Budget with the review of plans and projects for public works. In many respects OMB, its successor agency, duplicates and oversees many of the functions of the Council. OMB often has spurred the Council to face policy issues that it otherwise might not have tackled, e.g., to increase the discount rate and to formulate a unified national flood protection program. On the other hand, OMB has sometimes effectively vetoed useful Council decisions, such as the Council's decision that it should coordinate Federal negotiators and representatives on interstate water compacts. There has been no chairman consistently willing and able to speak directly to the President on water policy matters when OMB has vetoed a Council position. The chairman of the Council should be able to do this. OMB is too much concerned with political and budgetary considerations to permit it effectively to be the water policymaker in the executive branch.

The second effect of these recommendations would be to strengthen the links between the President, the Council members, and the members of the COR. The alternate of a member should be able to speak for the member and his entire department or agency. An assistant secretary or person of equivalent status, with major responsibilities for water resources matters in his department or agency, seems to be required. Since the COR is a key working group of the Council, it must be composed of able persons, each of whom is close enough to his member to adequately represent him on the COR. The representative should approach problems from a national perspective. In many instances today the representative on the COR is not in close contact with either the member or his alternate. Upgrading the COR



Water interrelationships require close coordination on all levels.

representative, freeing him to devote substantially full time to Council activities, and having him report to the member or his alternate appears to be a way to solve this problem.

The policymaking component of the Council staff should be strengthened with additional qualified personnel so that this component may devote full time to policy issues, develop positions, and make recommendations. Strengthened policymaking should also help to improve the planning program. Having the staff report to the independent chairman will keep it independent of the COR and strengthen the chairman.

- 11-3. Federal appropriations for all resources planning studies being conducted under the auspices of the Water Resources Council should be made to the Council, and the Council made responsible for assigning studies and apportioning funds.

The present system of financing river basin studies is not satisfactory. Federal moneys for river basin planning go to the participating Federal agencies rather than to the entity making the study. The appropriated moneys may never become part of the study budget; agencies may use their funds to insure that their projects are in the plan; shifting of funds as changes occur is difficult; the agency with the money may not be the best entity to do the planning, and central direction of the river basin planning effort by a responsible body or person is made more difficult. A more central administration of the river basin planning moneys by a Council, revised as set forth in 11-1 and 11-2 above should produce better plans. The provision in Section 209 of the Federal Water Pollution Control Act Amendments of 1972 for Council financing of Level B plans is an important step in this direction.

- 11-4. The grant program in Title III of the Water Resources Planning Act should be extended for at least 5 years beyond the statutory expiration date, and the present statutory ceiling of \$5 million per year should be removed.

The program of Federal grants to States for augmented water planning has been beneficial, but the amounts granted have not been sufficient to adequately build up State capabilities. From 1965, when the Water Resources Planning Act was passed, until 1972 only about half of the moneys authorized by the Act were appropriated by Congress for the State grant program. The States' participation in the Council's comprehensive planning program in many cases has been that of reacting to federally conceived plans. The States should take a more active part in planning for conservation and use of the Nation's water resources. Increasing grants to States under Title III and extending the grant program for 5 more years, through FY 1981, would help achieve this goal.

- 11-5. All applications emanating in any single year from various agencies of a particular State seeking Federal funds for water and related land resource planning and programs should be consolidated into a single

grant application and submitted to the Water Resources Council for coordination of the applications for funds from the various appropriate Federal agencies.

The President, by Executive Order 11647 issued on February 12, 1972, established Federal Regional Councils to coordinate the grant programs of the Federal human resource agencies (Labor; Housing and Urban Development (HUD); Health, Education and Welfare (HEW); Transportation; Office of Economic Opportunity (OEO); Environmental Protection Agency (EPA); and the Law Enforcement Assistance Administration). No such councils have been established to coordinate grants to States from the various Federal agencies for water planning and programs.

At present, States apply to many Federal agencies for water planning and program grants. A Federal agency to whom an application is made often is unaware of grants being made by or sought from other Federal agencies for water resources purposes. There is no overview of all of the Federal grants for water purposes to a particular State and no unified Federal judgment as to whether the grants sought are the best combination from both the national and the State points of view. The Water Resources Council coordinated a consolidated application from the State of Ohio and documented its experience. Its report suggests the need for further consideration of the general problem of grant coordination, and particularly the role of the integrated Grant Application Program discussed under Municipal and Industrial Water in Chapter 5 of this report. An executive order or other appropriate directive should be issued requiring the consolidated grant application approach from States seeking Federal funds for water resources planning and programs.

- 11-6. The Water Resources Planning Act should be amended to make the Secretary of Commerce, the Secretary of Housing and Urban Development, the Administrator of the Environmental Protection Agency, and the Chairman of the Atomic Energy Commission statutory members of the Water Resources Council; and to eliminate statutory membership for the Secretary of Health, Education and Welfare.

In 1969, the members of the Water Resources Council approved a proposal to add the Secretaries of Commerce and HUD, and the Administrator of EPA to the Council as full statutory members. Legislation was drafted for this purpose but was not forwarded by the Administration to the Congress, apparently because it seemed inconsistent with proposed Administration legislation to reorganize the executive branch. Today, the Secretaries of Commerce and HUD and the Administrator of EPA are nonstatutory associate members of the Council; they cannot vote and their roles are essentially advisory.

Each of these agencies has been given substantial water resources responsibilities since enactment of the Water Resources Planning Act in 1965.

The Department of Commerce now has statutory responsibilities for certain marine resources affairs and for fostering industrial expansion and economic development involving substantial use of water resources.

The Department of Housing and Urban Development plans for urban population centers and provides a link between urban planning and comprehensive river basin planning. Its administration of the flood insurance program, established pursuant to the Housing and Urban Development Act of 1968, requires coordination with flood damage prevention programs, for which the Council has major responsibilities.

The continued expanded use of nuclear power, the role of nuclear power in regional powerplant siting and river basin planning, and the licensing of nuclear powerplants all involve consideration of impacts on water resources. The Atomic Energy Commission has direct programmatic interest in the problem of waste heat disposal connected with nuclear generation of electric energy. During the past 2 years, the AEC has become a full member of several river basin commissions and is participating actively in the development of comprehensive river basin plans.

EPA now has the major responsibilities for water quality, a function that must receive adequate planning and coordination by the Council. The water quality function was vested in HEW at the time the Water Resources Planning Act was passed in 1965. While HEW today has some water-related responsibilities, particularly in the field of public health, those responsibilities do not seem to justify continued statutory membership in the Council for HEW, which could hereafter participate in Council affairs as an associate member. There is some virtue in not having the statutory membership of the Council grow too large, and thus only those departments and agencies with major water responsibilities should have statutory membership.

The Water Resources Planning Act should be amended to achieve the ends of this recommendation. If and when a Department of Natural Resources is established, Congress at that time can review the Water Resources Planning Act to see what other amendments to that Act would then be appropriate. Full membership now in the Council for the Secretaries of Commerce and HUD, for the Administrator of EPA, and for the Chairman of AEC should better enable the Council and those agencies to carry out their statutory responsibilities.

- 11-7. Congress should enact appropriate legislation giving to the chairman of the reconstituted Water Resources Council the responsibility for coordinating Federal participation in the negotiation and administration of river basin compacts of the Delaware and Susquehanna types, and water management compacts of the Ohio River Valley water-sanitation compact type.

There is a need to provide a focal point within the Federal Government for coordination of the Federal interest in interstate and Federal-interstate compacts dealing with water and related land resources. An independent

chairman of the Water Resources Council, which is charged by Congress to encourage the development of water and related land resources on a comprehensive and coordinated basis, would be the appropriate person on the White House Staff to have the responsibility for performing that function.

The independent chairman of the Council should maintain and distribute to appropriate Federal officers and agencies current information relating to water compact negotiations and administration which may affect Federal interests. He should provide appropriate information, advice, and assistance to States in the negotiation and drafting of water compacts. He should assist Federal representatives to compact negotiations in obtaining information, advice, and support from other Federal agencies; he should help develop a coordinated Federal position on all substantive issues that arise in the course of negotiations for the guidance of the Federal representative; and he should submit to the President his views and recommendations, as well as those of the Council, on any water compact presented to Congress for approval.

The chairman of the Council should also provide guidance to Federal representatives on compact commissions whether they serve a limited role as on the Ohio River Valley Water Sanitation Commission or the highly important role of Federal representative to a Federal-interstate compact of the Delaware and Susquehanna variety. Federal representatives in the administration of the water compacts should report to the President through the chairman of the Water Resources Council.

RECOMMENDATION ON A BOARD OF REVIEW

- 11-8. Legislation should be enacted to establish an independent board of review to examine federally funded water development proposals, river basin plans, and water development grant programs and to advise the President and the Congress on their need, feasibility, and utility. The chairman of the board of review should be the same person who serves as the independent chairman of the reconstituted Water Resources Council.

Section C. New Functions for Federal Water Agencies

RECOMMENDATIONS ON NEW FUNCTIONS

- 11-9. Legislation should be enacted to establish in the Department of the Interior an agency made up of the National Oceanic and Atmospheric Administration and the United States Geological Survey, and to assign to the new agency responsibility for the collection and distribution of basic data on the Nation's water resources. The fisheries functions of NOAA should be merged with the Fish and Wildlife Service of the Department of the Interior, and the coastal

- zone management functions should be handled as a part of the overall land planning functions of the Federal Government.
- 11-10. The Watershed Protection and Flood Prevention Act of 1954 should be amended so that the Department of Agriculture no longer performs engineering functions under that Act, such as design of reservoirs and channels for flood control or land drainage, that may be readily provided by non-Federal organizations at the local level.
 - 11-11. The Bureau of Reclamation should continue to bear responsibility for the construction of Federal reclamation projects until such time as projects under construction or under repayment contract are completed. While this is being accomplished, its engineering design and construction activities should be gradually phased out. It should progressively strengthen its capability as a water management entity, and eventually its principal responsibility, in addition to operating works retained under Federal control, should be that of improving the efficiency of water use in the water-short regions.
 - 11-12. The Civil Works Program of the Corps of Engineers should be modified to: (a) limit the agency to design and construct only those engineering works that cannot as efficiently be provided by States, by interstate regional commission, or by conservancy, drainage, port, irrigation, or similar local districts; and (b) increase the emphasis placed upon the nonstructural segments of its programs, such as that segment through which it provides States, municipalities, and other non-Federal public entities with information they need to make more efficient use of flood plain lands.
 - 11-13. An Office of Water Technology should be established in the Department of the Interior, combining the functions of the existing Office of Water Resources Research, the Office of Saline Water, the weather modification activities of NOAA, the weather modification and geothermal programs of the U.S. Bureau of Reclamation, and the research on wastewater reuse technology of the Environmental Protection Agency. Although it would be placed for administrative purposes under the jurisdiction of the Secretary of the Interior, the Office of Water Technology should be given a charter broad enough to meet research needs other than those of the Department of the Interior.

Section D. Organizations for Water Planning and Management for River Basins and Other Regions

Intrastate Organizations

CONCLUSIONS ON INTRASTATE ARRANGEMENTS

The experience of Ohio with the Miami Conservancy District and the Texas experience with its river authorities indicate that such organizations, especially if they are granted broad powers and have an independent financial

base, can be useful institutional arrangements in planning and developing the water resources of intrastate river basins, particularly in conjunction with regional land use planning. Such organizations would appear to be especially useful in intrastate basins or subbasins which do not have entities planning or developing the water resources of the area. They would also be useful as integrating devices in intrastate basins or subbasins where water resources activities are fragmented among a number of existing local entities.

The Texas experience indicates that if river authorities do not have territorial jurisdiction generally coextensive with a river basin, the resulting fragmentation in authority may not produce optimum solutions to basin problems. On the other hand, river authorities for subbasins can be useful devices, particularly if there is an effective coordinating mechanism with river authorities in other parts of the basin. Contractual arrangements between intrastate river authorities can provide that coordinating mechanism. On interstate streams, interstate compacts may provide that coordination. State river authorities for subbasins of a river flowing between two or more States, when linked together by an interstate or Federal-interstate water compact commission, would appear to be useful organizational arrangements for water resources planning and development.

State river authorities appear to be useful mechanisms for attacking problems of water pollution on an intrastate regional basis. They can make water quality plans for a region and construct regional waste disposal systems. The Gulf Coast Waste Disposal Authority appears to hold much promise, particularly for coastal areas outside of the boundaries of river authorities.

RECOMMENDATION ON INTRASTATE ARRANGEMENTS

- 11-14. States should consider the use of river basin authorities, similar to the Texas river authorities, in the planning and management of their water resources for river basins or portions thereof lying within the State, particularly in areas not already included within the territory of existing effective entities. States should also consider the use of such river basin authorities in combination with an interstate compact commission for rivers flowing between or among two or more States.

Ad Hoc and Interagency Committees and River Basin Commissions for Planning

CONCLUSIONS

River basin commissions are to be preferred over interagency and ad hoc committees for water and related land resource planning and should be encouraged as regional planning entities for water and related land resources. The commissions are new and unique regional institutions, and should be

given a chance to develop joint coordinated comprehensive plans for their regions.

RECOMMENDATIONS ON INTERAGENCY COMMITTEES AND RIVER BASIN COMMISSIONS

- 11-15. The planning of water and related land resources in the United States for major interstate river basins should be done by Federal-interstate compact commissions or by river basin commissions established under Title II of the Water Resources Planning Act rather than by ad hoc or interagency coordinating committees.
- 11-16. The interests of important local units of government, particularly entities comprising large metropolitan regions in the area of a river basin commission's jurisdiction, should be reflected more fully in the deliberations of river basin commissions and Federal-interstate compact commissions.
- 11-17. After completion of its comprehensive coordinated joint plan, a river basin commission should be continued in order to (1) update and revise the plan, (2) continue the coordination of planning efforts, and (3) reestablish and revise priorities.

Interstate and Federal-Interstate Water Compacts

RECOMMENDATIONS ON INTERSTATE COMPACTS

- 11-18. The Federal-interstate compact is recommended as the preferred institutional arrangement for water resources planning and management in multistate regions.
- 11-19. Congress should enact legislation granting advance consent to a limited class of water compacts not having a significant impact on Federal interests. Such compacts should be submitted to Congress to become effective 90 days thereafter unless, within the 90-day period, Congress denies its consent.
- 11-20. Any interstate water compact granting broad project construction or regulatory authority to a compact commission should state the roles of the compact commission and of existing State and Federal agencies with regard to project construction, water quality, and other regulatory functions.
- 11-21. Congress should enact legislation (1) granting the Federal district courts original jurisdiction over any case or controversy arising under an interstate water compact and (2) waiving the sovereign immunity of the United States and permitting the United States to be made a party defendant in such a suit.

CONCLUSIONS ON FEDERALLY CHARTERED REGIONAL CORPORATIONS

There are no insurmountable legal barriers to the utilization of the federally chartered corporation as an administrative device for resolving water management problems involving joint efforts by two or more States (or the local governmental subdivisions of two or more States) in which the Federal Government also has a legitimate interest; however, unless the corporation is approved by, or itself stems from, an interstate compact, it may not be able to exercise some of the governmental powers of the participating States.

The corporate device, because of its flexibility and relative isolation from political control and responsibility, lends itself best to operational tasks rather than planning or regulatory activities intended to be binding upon outside parties.

Utilization of federally chartered corporations as a substitute for Federal-interstate compacts normally will not expedite materially the formation of broad-scope waterway agencies like the Delaware River Basin Commission. However, the federally chartered corporation, as an alternative method of organizing such agencies, might prove useful in isolated situations. Consideration should be given to authorizing river basin commissions, which have been or will be established by compact, to themselves establish subsidiary corporations. These could perform the discrete operational tasks which otherwise are likely to be subordinated to the river basin commission's planning and regulatory activities, and which the commissions may not be as well equipped to perform themselves as through subsidiary corporations established for the specific tasks.

Federally chartered corporations, with or without direct membership by representatives of the Federal Government, can play an important role in facilitating joint efforts by the local governmental units of two or more States sharing a waterway to handle such limited functions as water treatment and supply. In view of the Federal interest in such waterways and the historical precedents in the water resources field, resort to reciprocal State legislation, without any Federal legislative input, would not generally appear to be feasible. There would appear to be some real hope in this more limited area for general Federal enabling legislation.

RECOMMENDATIONS ON FEDERALLY CHARTERED REGIONAL CORPORATIONS

- 11-22. Legislation should be enacted granting advance consent to two or more States to enter into a compact to establish a corporation to carry out limited water resources operation and management functions, such as water supply and wastewater management. Such

legislation should spell out the terms and conditions under which such corporations may be established and operated.

- 11-23. Legislation should be enacted to enable two or more States, or two or more local governing bodies if at least one is located in a different State, to form corporations, or become a member of an existing corporation, for the purpose of carrying out discrete water resources operation and management functions. Such corporations could be chartered under either Federal or State law, with or without Federal membership. The congressional legislation should specify the terms and conditions under which such corporations may be established and may operate.
- 11-24. Legislation should be enacted to enable future or existing interstate or Federal-interstate water compact commissions, such as the Delaware or Susquehanna River Basin Commissions, to establish corporations, chartered under either Federal or State law, for the purpose of carrying out discrete water resources operation and management functions within the delegated powers of such commissions. These subsidiary corporations should not be limited to the same member-participants as the commission's member-participants. The States involved should also pass appropriate enabling legislation.

Section E. The Great Lakes

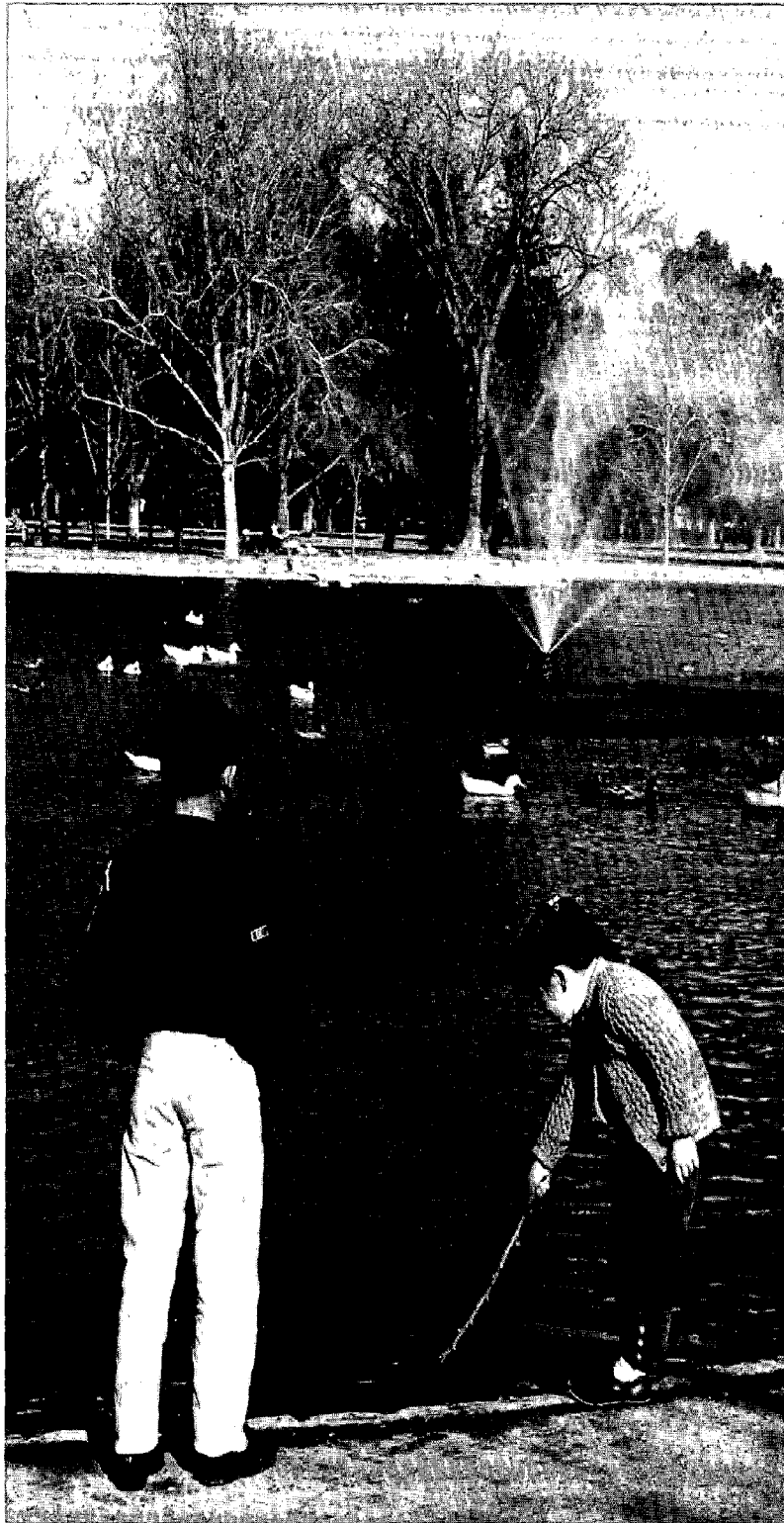
RECOMMENDATIONS ON THE GREAT LAKES

- 11-25. The President should work with the Governors of the Great Lakes States toward the creation of a Great Lakes task force to negotiate and obtain consent to a Federal-interstate compact especially designed to suit the unique circumstances of the Great Lakes Basin, including provisions for eventual cooperation with Canada on problems which transcend the international boundary.
- 11-26. Federal funds for research should be allocated to the Great Lakes Basin Commission or its successor over a period of at least 4 years to develop improved methods for analyzing the impact on the Lakes of alternative management strategies.

CHAPTER 12. WATER PROBLEMS OF METROPOLITAN AREAS

CONCLUSIONS

In recent years, a number of different studies have resulted in recommendations that certain local government functions throughout entire metropolitan areas be consolidated. In many situations such an approach for



Consolidation of some water service functions in metropolitan water systems improve the physcial and economic operation of such systems.

selected functions of some water services will improve the physical and economic operation of metropolitan water systems.

While areawide consolidations may not everywhere be necessary or desirable, in many instances they can result in economies of scale, improvements in efficiency and reliability, better coordination, and better overall use of the water resource. Where they are implemented, the anticipated loss of local control and legal and technological problems can usually be mitigated and offset by the advantages to be gained. There are, however, limits to what can be achieved through areawide consolidation. Efficiency gains are more dramatic in areas of high population density than in sparsely populated suburbs. Economies in construction of consolidated water supply, wastewater treatment plants, and drainage facilities do not necessarily extend to local water distribution and wastewater collection facilities, although in larger systems consolidation of distribution and collection also can yield economies in central purchasing, better equipment, specialization of crews, and higher quality supervision.

Relationships among water services and between water services and other urban services need to be recognized. Placing the planning for different functions of basic water services under joint administration and coordinating the performances of other functions such as design, construction, operations, and maintenance can result in savings in the cost of providing services and enable the better use of metropolitan water resources. Land use planning and utility planning need to be coordinated. Planning for water should complement existing plans for the use of land. Water utility planners should design water systems which are complementary to land use goals but should anticipate and be prepared to accommodate to changes in land use plans that may come about in the future.

More attention by water planners and managers to esthetic, recreational, and environmental values can, within limitations imposed by other aspects of their duties such as maintaining the quality of water supplies, enable management of water utilities to help improve the urban environment.

Existing local governmental institutions which traditionally have delivered water supplies and handled wastewaters are in some cases being strained and are unable to meet the water supply and treatment demands being made of them. These existing institutions can and should be strengthened through State and local government reforms whereby (1) long-term State and river basin planning is made to account for metropolitan needs, (2) municipalities can exercise extraterritorial powers to prevent inefficient, unplanned water services from developing in their metropolitan areas, (3) areawide water management authorities are authorized and implemented, (4) interlocal contracting and the joint exercise of local government powers is encouraged, and (5) cities are not permitted to make excessive charges to water users served outside their corporate boundaries.

The Federal Government must assist the States and local governments in

solving metropolitan problems of an external nature arising from the facts that (1) many metropolitan areas extend over two or more State boundaries, (2) many metropolitan areas must look beyond their jurisdictions to obtain supplies, and (3) their effluent discharges affect areas beyond their jurisdictions. To date, interstate compact commissions have not been effective devices to solve such problems, but with improvements, they may prove able to make appropriate allocations of supplies and regulation of discharges for metropolitan areas. Metropolitan areas must be given a more direct voice than they have at present in the regional planning process.

Data on some aspects of urban hydrology are inadequate to meet the future needs of metropolitan area water management. Moreover, techniques for joint administration of some metropolitan water services on an areawide basis will create even greater demands for data and for analysis of the data that are available to enable water managers to make timely operating decisions throughout the system.

RECOMMENDATIONS

- 12-1. Municipalities, county governments, special districts, and other local government units should continue to explore the potential for consolidating separate tasks in providing water services to achieve economies of scale throughout all or significant portions of their metropolitan areas.
- 12-2. Municipalities, county governments, special districts, and other local government units responsible for providing basic water services in a metropolitan area should improve the efficiency and effectiveness of those services by coordinating the planning for water services with the planning for land use and occupancy. Consideration should also be given to combining other functions, such as engineering and design, construction, operation and maintenance, finance and collections, for different water services. Extension of such combined services should also be made to all or to significant portions of a metropolitan area where gains in efficiency and better use of resources can reasonably be expected to result.
- 12-3. In addition to reliance on hydrologists and engineers, water planners and managers should enlist the aid of landscape architects, architects, recreation specialists, and urban planners to help them make full use of whatever opportunities there may be to provide water services in ways that will also provide recreational and esthetic benefits to metropolitan area residents.
- 12-4. The following State and local government actions should be taken to improve metropolitan area water management.
 - a. States, with the cooperation of metropolitan areas, should prepare State water resources plans that account for metro-

politan area needs and that require the head of the appropriate planning agency of the State government to encourage, assist, and advise metropolitan and local government agencies responsible for planning metropolitan area water programs, particularly with respect to preparation and updating of regional metropolitan water resources plans.

- b. States should enact legislation authorizing new metropolitan management authorities, which may be created from and made up of existing local entities, to provide and coordinate specified public water services for particular areas including the main water supply, wastewater treatment, and storm drainage functions. Accompanying the legislation to authorize new management authorities should be additional legislation to establish procedures to insure that the activities of special authorities are coordinated with those of other government units and that the public is fully aware of the activities of special authorities operating within metropolitan areas.
- c. States should permit local government units to cooperate with other localities in providing services and facilities in accord with geographic, economic, population, and other factors that influence their mutual needs and developments by authorizing interlocal agreements and contracts for the joint use and exercise of their powers, privileges, or authority.
- d. States that have not done so should consider legislation to authorize cities to exercise jurisdiction for planning and implementing water resources management, including zoning and subdivision regulation, in areas adjacent to or just beyond their corporate limits when annexation of those areas is part of a State or county plan for city expansion. Such extraterritorial jurisdiction should not, however, be permitted to interfere with the exercise of lawful jurisdiction for the same areas for the same or similar purposes by counties, towns, special districts, or other units of local government.
- e. States that have not already done so should consider legislation giving appropriate State and local authorities regulatory authority over individual wells and septic tank installations and directing the development of plans for metropolitan areawide water and sewerage systems that (1) provide for the orderly extension and expansion of metropolitan area water supply and sewerage system; (2) assure adequate sewage treatment facilities for safe and sanitary treatment of sewage and other liquid waste; (3) delineate portions of the metropolitan area which the systems may be expected to serve at projected dates in the future; and (4) set forth schedules and methods of acquiring

necessary land and financing the construction and operation of the proposed system.

- 12-5. Congress should invite the formation of interstate compacts to solve water problems of multistate metropolitan areas by delineating the conditions under which it will give advance consent to compacts made for purposes of managing multistate metropolitan water systems.
- 12-6. Federal grant procedures should not be based on decisions made by local organizations that are not duly constituted under State law and politically accountable to their local electorate.

CHAPTER 13. FEDERAL-STATE JURISDICTION IN THE LAW OF WATERS

CONCLUSIONS

The Commission believes that existing law creates unnecessary friction between the Federal Government and the States, and poses threats of uncompensated taking of water rights held by private citizens under State law. These defects in present law can be remedied without impairment of Federal powers and Federal functions.

One source of friction is the failure of the Federal Government to proceed in conformity with State law when making use of water. As a consequence, adequate records of water use do not exist, impairing State and private planning and investment. All Federal uses of water, present and prospective, should be recorded with the State in accordance with State forms and procedures. Further, Federal water uses should comply with State law except in those cases where State law conflicts with the purposes of a Federal program or project authorized by Congress. The determination that a conflict exists should be the responsibility of the Federal program officer, subject to judicial review. The immunity of the United States from law suits should be waived so that such conflicts can be adjudicated. Sovereign immunity should also be waived so that Federal and State water rights can be determined and integrated into a single system of administration. Owners of State water rights should be able to sue the United States in Federal Courts for unlawful interference with the exercise of their rights.

Two legal doctrines enable the United States to take State created water rights without payment of compensation. The navigation servitude, created by the courts and already greatly modified by Congress, allowed the United States to take land and water without paying for water-dependent values in navigable streams. This doctrine should be changed and the United States required to proceed pursuant to the policies of Section 301 of the Uniform Relocation Assistance and Real Property Acquisition Act of 1970.

The reserved rights doctrine as it applies to withdrawals of land for purposes other than Indian Reservations was first announced in 1963 and permits the creation of a water right by mere reservation of land for Federal use and without contemporaneous initiation of a water use. Many reservations were made between 70 and 100 years ago, but water has yet to be diverted onto the reserved land. Meanwhile, non-Federal uses have been made of the water supply, and these uses would be subject to divestment by future Federal action. In order to prevent such divestment without compensation, the non-Indian Federal reserved right to make use of water in the future should take its priority from the date the use is initiated, not from the date of the reservation. Minimum flows may be established using unappropriated water to protect instream values in waters on Federal lands.

RECOMMENDATIONS

- 13-1. The United States should adopt a policy of recognizing and utilizing the laws of the respective States relating to the creation, administration, and protection of water rights (1) by establishing, recording, and quantifying existing non-Indian Federal water uses in conformity with State laws, (2) by protecting non-Federal vested water rights held under State law through the elimination of the no-compensation features of the reservation doctrine and the navigation servitude, and (3) by providing new Federal procedures for the condemnation of water rights and the settlement of legal disputes.
- 13-2. The United States, in making any use of water and in constructing, administering, and operating any program or project involving or affecting the use of water, should proceed in conformity with State laws and procedures relating to (1) the appropriation, diversion, and use of water and (2) the regulation, administration, and protection of water rights. This rule should be subject to two exceptions: (1) It should not apply to Indian water rights and (2) it should not apply where State law conflicts with the accomplishment of the purposes of a Federal program or project. In the second case the Federal official charged with administering the Act should be able to exercise his discretion in determining whether such inconsistency exists. If he concludes that there is a conflict or inconsistency, he should be obliged to hold a hearing on the question and thereafter set forth his conclusions in writing, which should be subject to judicial review.
- 13-3. Legislation should be enacted to provide:
 - a. that the United States may be joined as a party in proceedings for the adjudication of non-Indian water rights in any source of water, when the United States claims or is in the process of acquiring rights to water under the authority of an act of

Congress, as owner, by appropriation under State law, by purchase, by exchange, or otherwise, and where those rights would, if owned or claimed by a private citizen, be included in and determined by such proceedings. "Proceedings for the adjudication of non-Indian water rights" means such proceedings as are provided by State law for the determination, adjudication, certification, and recording of water rights, excepting, however, Indian water rights;

- b. that the United States shall be subject to all judgments, orders, and decrees of the court or agency conducting such proceedings;
- c. that the United States shall have the right to judicial review of proceedings in which it has been joined as a party under these provisions before the U.S. Court of Appeals for the Circuit in which the State lies. The right to seek such review shall arise after a final judgment or order is entered by the State administrative agency or the State trial court, as the case may be, and when the case is ripe for consideration by the first State appellate court having jurisdiction. Findings of fact by the State tribunal shall be sustained if supported by substantial evidence.

- 13-4.
 - a. If on the date the proposed National Water Rights Procedures Act becomes effective the United States is making use of water pursuant to an act of Congress or an Executive Order of the President, whether under the "reservation doctrine" on lands withdrawn from entry and reserved for Federal purposes, or on other lands pursuant to other authority, and the right to make such Federal use has not been filed with the State in conformity to State law, the Federal agency or officer in charge of such use should establish the quantity of such use and record the use by proceeding in conformity to State procedures for the acquisition and adjudication of water rights by other water users.
 - b. In the case of reserved lands of the United States, the priority of the water right should be the date the reserved land was withdrawn from entry; in the case of other lands owned by the United States, the priority of the water right should be the date the water use was initiated.
 - c. The proposed Act should also provide standards and procedures for establishing minimum flows in streams crossing Federal lands for the purpose of preserving instream values in such waters. The minimum streamflows should be limited to unappropriated water and should be recorded in the State water rights records as provided in (a) above.
- 13-5. Any withdrawal, diversion, or use of water initiated by an agency or officer of the United States *after* the effective date of the proposed

Act, for use on or in connection with any lands of the United States reserved or withdrawn at any time for any purpose other than for an Indian reservation, should be made in conformity to State law, as provided for in Recommendation 13-2, and the priority date of the water right for such use should be the date of the initiation of the use by application for permit or otherwise as determined by State law.

13-6. In any State which requires a permit for the initiation of a use of water, or otherwise regulates the initiation of the use of water, the United States may apply for a permit or other permission to use water under State law, and, subject to vested rights, it should have the right to use such water from the date of its application if the following conditions are met:

1. Congress authorizes the construction of the project for which the application was made within 5 years of the date of the application; and
2. Construction of the project commences within 5 years of the date of congressional authorization.

Provided, however, that:

- a. Nothing in this recommendation is intended to deny the application of State law which allows longer periods of time for the initiation of water development projects; and
- b. Nothing in this or in Recommendation 13-5 above is intended to affect water rights for projects authorized by Congress prior to the effective date of the proposed Act. Specifically, any project authorized before the proposed Act takes effect, which project was designed to use reserved water rights appurtenant to withdrawn lands, shall be entitled to the amount of water and the priority date that obtained under Federal law prior to the enactment of the proposed Act.

13-7. The proposed Act should provide that whenever the United States or a person acting under its authority takes, destroys, or impairs any right, acquired under the laws of a State, to the diversion, storage, or use of any water, in connection with or as the result of any Federal project for development of navigable or nonnavigable water or for altering its flow or level, the United States will pay to the owner the fair market value of such water right.

13-8. The proposed Act should provide that whenever the United States, in the construction and operation of a water resources project or in obtaining a supply of water for a use on Federal land or for a Federal purpose takes, destroys, or impairs existing water rights, the policies of Section 301 of the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 shall specifically apply to

such projects and uses, and the United States shall initiate proceedings to acquire, by negotiated purchase or condemnation, existing water rights so impaired or to acquire and use other water rights so as to avoid such impairment. It should be the policy of the United States to require its agencies and officials to proceed in conformity with State laws governing the acquisition of water rights by preferred users, and to acquire by purchase or condemnation specific water rights which will provide it with the needed quantity of water rather than taking the required amounts of water from the source and forcing the holders of water rights to prove injury and damage.

13-9. The proposed Act should provide that:

1. A person alleging an unlawful interference with his right to the diversion, storage, or use of water by the United States, its agents or officers, may bring an action in a District Court of the United States for appropriate relief.
2. A State official, acting in his official capacity, alleging that the United States, its agents or officers, have violated State law without justification under the law of the United States may bring an action in a District Court of the United States for appropriate relief.
3. Such actions shall not be dismissed nor relief denied on the ground that it is against the United States or that the United States is an indispensable party. The United States may be named as a defendant in any such action and a judgment or decree may be entered against the United States. Nothing in this provision is intended to affect other limitations on judicial review or on the power or duty of the court to permit any action or deny relief on any other appropriate legal or equitable grounds. The action may be brought against the United States, the Federal agency, or the appropriate Federal officer. Such an action may be brought in any judicial district in which (a) a defendant in the action resides, or (b) the cause of action arises, or (c) any real property or water right involved in the action is situated. Additional persons may be joined as parties to any such action in accordance with the Federal Rules of Civil Procedure without regard to other venue requirements.

- 13-10. To achieve the reforms which the Commission believes should be made with respect to Federal-State relations in the law of water rights, the provisions of Recommendations Nos. 13-1 through 13-9 should be enacted in a proposed "National Water Rights Procedures Act" covering the problems discussed in this chapter of:
- a. conforming Federal water uses to State procedures;

- b. future use of water on Federal reserved lands other than Indian Reservations;
- c. the navigation servitude and the rule of no compensation;
- d. eminent domain procedures; and
- e. sovereign immunity.

CHAPTER 14. INDIAN WATER RIGHTS

CONCLUSIONS

The Commission concludes that there is increasing danger of conflict between Indian and non-Indian uses of water. The problem arises from the fact that many non-Indian water resource projects rely on supplies in which Indians have water rights with earlier priorities. Indians wish to make use of their water, and the Commission, recognizing the legitimacy of this desire, believes that the Secretary of the Interior should conduct studies of the natural and human resources available on Indian Reservations in cooperation with the Indians for the purpose of developing plans for the utilization of the resources. At the same time, it is important to obtain a quantification of existing uses on Indian Reservations and to provide procedures for adjudicating Indian rights to make new uses. These quantifications should be filed for information purposes with the State authorities who maintain records of non-Indian uses within the State, but such filings should not subject Indian water uses to State laws or State regulation. While adjudications are not necessary for all Indian Reservations at this time, no new Federal water resource project should go forward until an adjudication is had of Indian water rights that might substantially affect the project's water supply.

The forum for adjudicating Indian water rights has received the Commission's attention. At one time the Commission proposed to adjudicate Indian water rights in State tribunals according to State procedures with an appeal to the Federal circuit court of appeals. The Indian tribes objected to the proposal because of controversies stretching back over the years between State officials and Indians over water rights. It seemed preferable, therefore, to place the litigation in the Federal courts, the traditional forum for determining Indian water rights.

The most intractable problem the Commission faced is the conflict between existing non-Indian uses and newly initiated Indian withdrawals. While the Indians often have legal superiority to make use of water, a later initiated Indian use often would disrupt preexisting non-Indian uses representing large Federal, State, and private investments. One means of ameliorating the conflict is to provide for the Federal Government to lease Indian water and water rights in fully appropriated streams when the Indians are of a mind to sell, but condemnation of unused Indian water rights is not an acceptable solution to the problem when Indians do not wish to sell. In



There is increasing conflict between Indian and non-Indian uses of water where Indians have prior water rights. These rights should be protected.

that event, the Commission recommends that a substitute water supply be provided, or if that is not feasible that compensation be granted to non-Indian water rights holders whose supply is impaired by future Indian development. This protection would be afforded only for development undertaken before the decision in *Arizona v. California* (June 3, 1963) and in the absence of actual advance knowledge of the existence of conflicting Indian water rights imperiling the water supply of the non-Indian development. The costs of the compensation would be a national obligation not chargeable to Indian projects and the compensation would not include those values generated by Federal subsidies to the non-Indian users.

RECOMMENDATIONS

- 14-1. At the request of any Indian tribe the Secretary of the Interior or such other Federal officer as the Congress may designate should conduct studies in cooperation with the Indian tribe of the water resources, the other natural resources, and the human resources available to its Reservation. An object of the studies should be to define and quantify Indian water rights in order to develop a general plan for the use of these rights in conjunction with other tribal resources. When warranted by the results of such studies, litigation should be instituted by the United States in behalf of the Indian tribe to adjudicate its water rights. Congress should appropriate funds to support the studies and the litigation.
- 14-2. Prior to the authorization of any federally assisted non-Indian water resource project, a final adjudication should be made of all Indian water rights which when exercised could substantially affect the water supply for the project.
- 14-3. Existing water uses on Indian Reservations, whether or not they have yet been adjudicated, should be quantified and recorded in State water rights records for the purpose of providing notice of such use. All adjudications or other binding determinations of Indian water rights whether heretofore or hereafter rendered similarly should be recorded. When requested to do so by a tribe, the Secretary of the Interior should also file notice of the existence of unquantified Indian water rights with the appropriate State official.
- 14-4. Jurisdiction of all actions affecting Indian water rights should be in the U.S. District Court for the district or districts in which lie the Indian Reservation and the water body to be adjudicated. Indian tribes may initiate such actions and the United States and affected Indian tribes may be joined as parties in any such action. The jurisdiction of the Federal district court in such actions should be exclusive, except where Article III of the Constitution grants jurisdiction to the U.S. Supreme Court. In such actions, the United States should represent the Indian tribes whose water rights are in

issue, unless the tribe itself becomes a party to the action and requests permission to represent itself. Any State in which the Reservation lies and any State having water users that might be affected by an Indian water rights adjudication may initiate an adjudication and may intervene in an adjudication commenced by others, including adjudications initiated by the United States and by Indian tribes. Upon such appearance by the State, the State may move to represent its non-Indian water users *parens patriae*, and the motion should be granted except as to non-Indian water users as to whom the State has a conflict of interest.

- 14-5. Congress should make available financial assistance to Indian tribes which lack the funds to make economic use of their water to permit them to make economic use of it. In addition, Congress should enact legislation providing that on fully appropriated streams the United States, shall make a standing offer of indefinite duration to Indian tribes to lease for periods not to exceed 50 years any water or water rights tendered by the Indian owners at the fair market value of the interest tendered.
- 14-6. Congress should enact legislation providing that whenever the construction and operation of a water resource project on an Indian Reservation shall take, destroy, or impair any water right valid under State law to the diversion, storage, or use of water off the Reservation, which right was initiated prior to the date of the decision in *Arizona v. California* (June 3, 1963), the United States shall provide a substitute water supply or pay just compensation to the owner of such right; provided, however, that:
 - a. such owner shall not be entitled to a substitute supply or to compensation if, prior to development of his right he had actual notice of conflicting Indian water rights claims that would render the water supply inadequate to serve the diversion requirements of himself and the Indian Reservation, and
 - b. compensation shall not include values created by subsidies granted by the United States to such owner.

The cost of such compensation shall be recognized as a prior national obligation and shall not be reimbursable by the beneficiaries of water resource projects on Indian reservations.

CHAPTER 15. PAYING THE COSTS OF WATER DEVELOPMENT PROJECTS

CONCLUSIONS

The Commission believes that joint Federal and non-Federal financing of water development projects is a useful and appropriate procedure for

accomplishing national objectives. However, the Commission has found what many other students of the subject have found and declared over many years—present cost-sharing policies are grossly inconsistent and lead to inefficiencies and inequities at both Federal and non-Federal levels.

There is a critical and long-recognized need for reform of cost-sharing policies. In the Commission's judgment, desirable reforms will not be forthcoming until cost-sharing policies receive extensive attention and review in the Congress. The Commission believes that the Congress should undertake such a review, looking toward enactment of cost-sharing legislation designed to remedy the deficiencies and to achieve the goals discussed in the following paragraphs.

Deficiencies in Present Cost-Sharing Policies

Cost-Sharing Policies Should be Consistent Among Alternative Means for Accomplishing the Same Purpose: Inconsistency in cost-sharing among different means for achieving a given purpose (such as flood control or water quality improvement) is a serious deficiency of present policies and leads to some means being inappropriately favored over others. To reduce these inconsistencies, (1) uniform cost-sharing policies should apply to all alternatives for a given purpose now available under agency authority and (2) the authorized scope of an agency's approaches to project development should be broadened to permit alternative means of producing desired ends, such as ground water pumping instead of dam building to augment periodic low streamflows, or relocation of people and property from hazard areas instead of levee building to protect against floods. To remedy this deficiency will probably require a broadening of the concept of a "project." For example, a flood control "project" might involve relocation of people away from a hazard area.

Cost-Sharing Policies Should be Consistent Among Federal Agencies for the Same Water Purpose: Present cost-sharing policies for specified water purposes are inconsistent among Federal agencies, which leads to considerable confusion and establishes incentives for distortion. Projects of some agencies are "pushed" more vigorously than similar or superior projects of other agencies. The grant agencies have established an interagency coordinating committee to channel applications to a single agency for negotiation, and thereby reduce or avoid the practice of "shopping around" by local groups. The Commission endorses this kind of coordination.

Cost-Sharing Policies Need Not Require a Uniform Percentage of Cost-Sharing for All Water Developments: Cost-sharing policies, varying among purposes and programs, cannot be improved simply by adopting a uniform cost-sharing formula. Variability among projects and shifting social preferences makes the adoption of a simple uniform percentage rule unwise.

Cost-Sharing Policies Should Require Uniform Terms for the Repayment of

Non-Federal Cost Shares: The considered use of subsidies which result when direct beneficiaries are relieved of some of the costs of water projects may be a desirable means for the Federal Government to accomplish some public policy objectives. When subsidies are granted, however, it is desirable that they should be open and straightforward, so that considered and informed reviews may be carried out from time to time as objectives and conditions change. It is the Commission's position that the proportion of Federal financial assistance to non-Federal interests should be set forth in decisions on cost-sharing and not concealed in policies governing the terms of repayment. Present inconsistencies in this regard contribute to misallocations of the Nation's always-limited investment capital resources.

The use of a lower interest rate for repayment arrangements than the interest rate used for project evaluation purposes is one of several alternative ways to inject subsidies into water projects. But, unlike straightforward allocations of project costs to non-reimbursable purposes, it tends to obscure the true magnitude of the subsidy. Hence, the Commission believes that unless it can be demonstrated as unsuitable, it is preferable that the interest rate used for project evaluation and for repayment arrangements should be comparable (assuming, of course, they realistically reflect the yield on long-term U.S. Government securities). In addition, the Commission believes that interest costs during construction and development should be included in the cost of projects and, where such costs are reimbursable, should be paid by beneficiaries.

Cost-Sharing Policies Should Promote Equity Among Project Beneficiaries and Taxpayers: Present cost-sharing policies tempt Federal water project beneficiaries to request projects that they would not be willing to pay for if their own money were involved. This leads to unwise development. For example, large Federal cost shares of flood control, drainage, and shoreline or hurricane protection projects have encouraged unwise economic developments in areas prone to periodic flooding and hurricane hazards. In some cases, large windfall gains have accrued to landowners and valuable open space and wetland areas have been destroyed. Likewise, availability of interest-free financing for irrigation projects has led to the construction of projects and facilities far in advance of need, and to the reclamation of lands at per acre costs far in excess of the value of the land after the project is completed.

Only by placing development of water projects for purposes that yield economic returns on a self-supporting basis can equity be promoted. The Commission believes that the best way to do this is for the identifiable users of project services insofar as is practicable and administratively feasible to bear their proportional share of development and operating costs of the projects through systems of pricing or beneficiary charges such as special assessments, taxes, and fees.

Cost-Sharing Policies Should Not Lead to Expansion of the Federal Role in Water Resources: Availability of Federal money under favorable cost-sharing arrangements has led in many instances to Federal construction of projects that could just as well have been built by non-Federal interests. Not only does this inequitably shift part of the cost of local benefits to federal taxpayers, but it tends to move control over water resources to Washington officials and increase the size of the Federal payroll. To alleviate this situation, the Commission believes cost-sharing arrangements should be the same for projects that serve the national interest, whether they are built by Federal agencies or by non-Federal entities.

The Role of Subsidies

The Commission does not disapprove of subsidies. But it believes that subsidies are only justified if they serve some compelling social purpose where society benefits, but where conventional markets and pricing mechanisms cannot provide those benefits. The Commission believes that a general rule to follow is this: Direct beneficiaries of water projects who can be identified and reached should ordinarily be obliged to pay all project costs that are allocated to the services from which they benefit. Where water projects are to be subsidized because conventional markets and pricing mechanisms cannot be counted on to achieve socially desired benefits, such subsidized projects should be the most efficient way to achieve the purposes for which they are developed. It need scarcely be added that whatever cost-sharing arrangements are adopted should be financially sound and administratively feasible.

Goals of Cost-Sharing Policy

The initial step in the general review of cost-sharing policies should be to reconsider the goals that water development programs are designed to accomplish. The Commission believes that the general goals of water project development should be: (1) to provide adequate supplies of water and water-related services for the Nation developed at least-cost over time; (2) to promote the efficient use of water and water-related services by users; (3) to encourage improved management of land and other related resources in conjunction with water; and (4) to promote harmony of water developments with other national policies and programs. These national goals can best be achieved through complementary activities by Federal, State, and local governments and by private enterprise. Cost-sharing policies should be reshaped to promote achievement of these goals.

When direct beneficiaries share in the costs of Federal projects, costs are distributed more equitably and incentives are provided to improve water development projects. Such cost-sharing by non-Federal interests:

1. Provides incentives to require that Federal water projects harmonize with land and water management activities of regional, State, and local governments and of private interests as well.
2. Discourages uneconomic development to serve low-value uses or in advance of real need for project services.
3. Reduces unfair subsidization by promoting a more equitable distribution of costs.
4. Reduces windfall gains to landowners and others.

In summary, appropriate cost-sharing policies should provide incentives for the selection of efficient projects that will lead to progress toward water resources policies that are in harmony with other national programs and policies. This requires projects to be in the proper locations, at the proper time, to provide the proper services in the proper amounts. Cost-sharing policies should be equitable, with project beneficiaries bearing proportionate shares of project costs. Adoption of the following recommendations will lead toward the achievement of these goals.

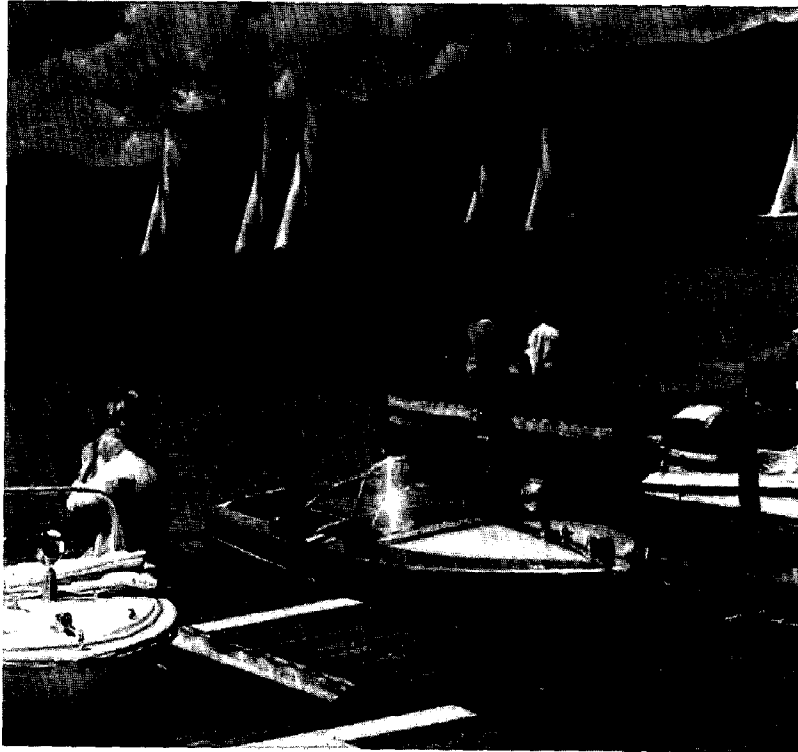
RECOMMENDATIONS

Legislation should be enacted to govern cost-sharing policy for Federal and federally assisted water developments, including arrangements for repayment over a period of time not beyond the useful life of projects of costs reimbursable to the Federal Government, and incorporating the principles stated below.

- 15-1. Insofar as is practicable and administratively feasible, the identifiable beneficiaries of project services should bear appropriate shares of development and operating costs through systems of pricing or user charges (e.g., special assessments, taxes, fees, etc.), as follows:
 - a. Municipal and Industrial Water Supply – Costs of Federal reservoir capacity allocated to municipal and industrial water supply should be completely recovered, with interest equal to prevailing yield rates for long-term U.S. Treasury bonds at the time of construction.
 - b. Irrigation Water Supply – All costs of new Federal irrigation facilities should be recovered from irrigators and other direct beneficiaries through contracting entities, with interest equal to prevailing yield rates for long-term U.S. Treasury bonds at the time of construction.
 - c. Inland Navigation – Costs incurred by the Federal Government for the operation, maintenance, and extension of the Nation's shallow-draft inland waterway system should be recovered as follows:
 - (1) Operation and Maintenance: By a combination of: (a) a uniform tax on all fuels used by commercial and recreational vessels when operating on the system; (b) lockage

charges at Federal locks in amounts sufficient to repay the cost of operating and maintaining all of the locks within integral segments of the total system. The charges should be imposed gradually to allow the industry time to adapt over a 10-year period, after which the total amounts collected should be sufficient to recover the entire cost of operating and maintaining the total system.

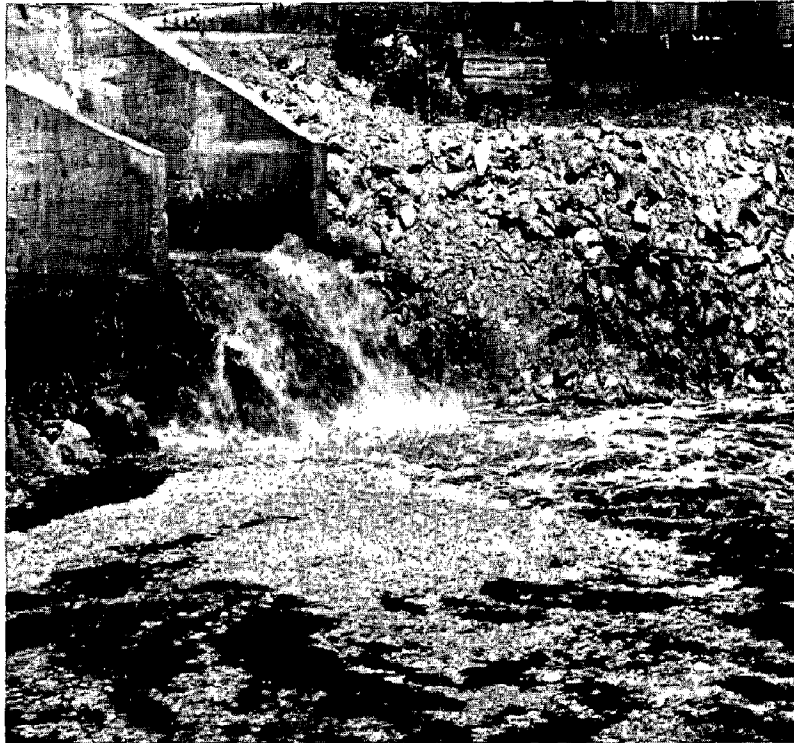
- (2) Extension of the System: Appropriate Federal or non-Federal entities should be required to reimburse the Federal Treasury, from charges assessed against the beneficiaries of the project over its useful life, for the entire first cost of each addition to the existing inland waterway system, with interest equal to prevailing yield rates for long-term U.S. Treasury bonds at the time of construction; provided that, if the Congress should determine that a part of the cost of any such addition is properly chargeable to national defense, it should authorize assumption of that part by the Federal Treasury.
- d. Electric Power – All real costs of construction, operation, and maintenance of future Federal hydropower projects should be recovered through sale of power at rates based on the true economic costs of production and transmission. Appropriate payments from power revenues should be made to local governments in lieu of taxes. Any excess revenues after the project is paid out should be returned to the Treasury.
- e. Water-Based Recreation – Recreation admission and user fees should be collected from all identifiable recreation users of Federal water projects where revenues can be expected to exceed the costs of collection. The goal should be to recover operation, maintenance, and replacement costs of recreation facilities, but charges should be related to fees charged for comparable nearby private facilities. If recreation and user fees are inadequate to offset the full recreation operation, maintenance, and replacement costs, consideration should be given to making up the deficit from other recreation-related revenue sources such as excise taxes on water-related recreation equipment. Where construction or operation of water development projects destroys, preempts, or degrades natural recreation opportunities, beneficiaries of the principal purposes of the project should pay, as part of the project's costs, for development and operation of substitute recreation facilities to compensate for lost recreation opportunities.
- f. Municipal Waste Collection and Treatment – Costs of municipal waste collection and treatment should be recovered through



Excise taxes on water-related recreation equipment could be a source of funds to offset recreation costs at Federal water projects.

charges based on the costs that users impose on the system; however, Federal grants will be required for a sufficient period to finance the massive investment programs now required to eliminate the backlog produced by generations of waste treatment neglect and meet higher standards now imposed. The Commission believes this period should be 10 years. Federal grants should be contingent on the adoption by the grantee of schedules of user charges that will recover all system costs exclusive of Federal and State grants.

- g. Flood Control, Drainage, and Shoreline Protection, Including Hurricane Protection – Costs of Federal or federally assisted projects providing such benefits as protecting lands through flood control, drainage, and shoreline protection, including hurricane protection, should be recovered from identifiable beneficiaries through local units of government such as municipalities, flood control, drainage, or shoreline protection districts that have power to make assessments upon lands benefited by the projects, or through State governments because of their critical role in determining flood plain management, with interest equal to prevailing yield rates on long term U.S. Treasury bonds outstanding at the time of construction.



Costs of municipal waste collection and treatment should be recovered through charges based on costs that users impose on the system.

15-2. Enhancing Environmental Values

There should be heavy Federal financial involvement in the preservation and enhancement of nationally significant water-related environmental areas including wild and scenic rivers, such as the Salmon, Buffalo, Suwannee, or upper Delaware, or unique wetlands, such as the Everglades. There is a Federal responsibility for enhancement of migratory waterfowl and anadromous fish species and for the preservation of designated endangered wildlife species. However, the enhancement of common species of fish and wildlife should be primarily a non-Federal responsibility and should be financed by States or, possibly, by Federal-State grant programs for these purposes. Cost of enhancement of species which can safely be harvested should be borne by user charges such as special duck stamps or license fees.

15-3. Regional Development

Economic development benefits of water projects accruing only to one region may result in offsetting losses in other regions. This result may be desirable and intended, i.e., it may be national policy to develop one region, for example, Appalachia, without regard for other regions. However, the analysis of whether a water project is the best use of Federal funds for development of a particular region

requires the expertise and judgment of agencies in addition to Federal water development agencies. In any particular region, Federal funds might be more effectively employed to achieve regional development by investing in transportation, education, or manpower training programs rather than in water projects.

Federal construction agencies should not be authorized to share in water project costs that are allocated to strictly regional development objectives. However, grants from other Federal agencies with regional economic objectives, such as EDA, should be eligible to meet such costs.

15-4. Low Flow Augmentation

Where practical, costs of low flow augmentation should be allocated and paid for in accordance with distribution of benefits. The beneficiaries of low flow augmentation are difficult to identify in a precise way, however, because release of stored water serves a number of purposes simultaneously. For example, low flow augmentation may benefit water supply, costs of which should be fully reimbursed. It may benefit navigation, costs of which should be paid for by user fees. It usually enhances fish and wildlife which should be paid for by the States involved unless national benefits are created. It also provides esthetic benefits which are of substantial regional or national value but not easily quantified or assigned to specific beneficiaries. Since it will be impossible to quantify all benefits and identify all beneficiaries, remaining unallocated costs should be assigned to water quality improvement and shared between Federal and non-Federal entities in the same proportion as grants-in-aid for waste treatment facilities. The cost share proportions, however, should be adjusted when necessary to reflect changes in the grant program for waste treatment.

15-5. Non-Federal Projects

Toward the end of providing financial incentives for the optimum design and operation of non-Federal multiple-purpose water projects, cost-sharing policies for Federal participation in such projects should be the same as for Federal water projects. Non-Federal projects also serve the national interest and Federal cost-sharing policies should fully recognize their contributions. For example, the river regulation purposes served by a hydroelectric power or water supply reservoir under State, local, or private ownership should be eligible for the same cost-sharing assistance as if the reservoir were under Federal control. In the case where water supply or low flow augmentation is needed, the additional reservoir capacity should be financed by the Federal Government where necessary and the costs subsequently recovered from the respective water users in accordance with recommendations for the purpose served.

15-6. Repayment Arrangements

Where the provision of initial excess capacity in water development projects is economically and environmentally superior to alternative piecemeal development of a series of smaller projects as each is needed, long-term Federal financing should be made available. This will be a definite advantage for project beneficiaries even where reimbursement requires full repayment with interest. Such long-term financing will facilitate development of large and complex projects serving various purposes where full capacity may not be utilized for several years. Repayment policies should provide for flexible repayment arrangements with provisions for deferred repayments and the capitalization of deferred interest charges.

CHAPTER 16. FINANCING WATER PROGRAMS

Capital Demands for Water Resources Development

CONCLUSIONS ON CAPITAL DEMANDS

The Commission finds that the estimated demands for capital at all levels of government for water resources development might range from \$23 to \$38 billion annually in current dollars through 1983 under policies that are being considered for implementation by Federal agencies and the Congress. This compares with capital expenditures by Federal, State, and local governments for highways of about \$12 billion in 1971 and 1972.

The major factor in these capital estimates is construction for wastewater treatment. The cost of meeting either water quality standards under the 1965 Water Quality Act or "best known technology" by 1983 will require huge amounts of capital. In addition, costs for operation and maintenance of waste management facilities are relatively much higher than for other types of water projects.

The Commission does not necessarily endorse these indicated levels of expenditure or suggest that all the plans should be implemented. It has found the available information inadequate to make such a judgment. The estimates presented here are intended to give an indication of the magnitude of expenditures necessary to support traditional water development programs at planned levels while increasing the level of investments in water pollution control facilities. In each case the cost of going ahead with the program must be weighed against the benefits to be gained before making a decision to proceed.

The Commission has not found it realistic to attempt to independently estimate the costs of meeting a "no discharge" goal of water quality management. The "no discharge" concept could be construed to imply either the distillation of water or prohibition of effluents from all point- and

non-point-sources of pollution. It is not clear whether this goal would apply to natural sources of pollution, such as salinity or organic debris. Furthermore, even with implementation of policies to recycle used materials, some waste products will need to be disposed of in air, water, or land resources. It is clear that, in some cases, water resources are the most economic and environmentally least damaging media for disposal. Each situation should be judged on the factual merits involved. If no discharge were really adopted as a mandatory goal, it is very likely that the costs would be beyond the capacity of the Nation to finance without seriously neglecting other pressing needs.

There is presently not only inadequate information on the investments required to meet various levels of water pollution control but also a lack of adequate information on the relative effectiveness of investments to control various sources of water pollution. There is a definite need for a cost-effective strategy to control water pollution.

Alternative Methods of Financing Water Developments

CONCLUSIONS ON FINANCING

An evaluation of State and local public facility needs and financing conducted in the mid-1960's for the Joint Economic Committee reached the conclusion:

... that sufficient funds would be available for requirements projected (but that) it is equally clear that this is only possible through heavy and growing reliance on commercial banks and to a lesser extent on two or three other specific sources of funds, e.g., personal trusts and fire and casualty companies.

Numerous attempts have been made to project revenue availability from the existing tax structure along with potential expenditures in the next decade. These fiscal surpluses, however, have a habit of disappearing just as cost overrides often swamp original construction estimates.

Realistically, it is concluded that the most likely sources of funding for new investments in water resource projects will come from incremental shifts in existing revenue structures. But the Commission believes that more reliance should be placed on user charge revenues.

Perhaps the most disturbing problem at the present time is that of persistent inflation. The problem of inflation is further aggravated at the local level because those goods and services purchased by local governments (school teachers, hospital services, construction, etc.) have risen in cost at a rate in excess of the general rate of inflation. Therefore, it is not sufficient to project average rates of inflation for the economy as a whole in considering future outlay requirements for water resource projects at State and local levels.

A serious problem facing water resources financing is that of inflexibility for future commitments because of high fixed levels of current commitments for all public programs. This was well illustrated by the statement of former Under Secretary of the Treasury Charles E. Walker, who indicated that in Fiscal Year 1973 Federal programs with permanent mandatory spending will absorb \$130 billion of total estimated outlays of \$250 billion for that period. In addition, mandatory increases are estimated to amount to \$11 to \$12 billion annually. Thus, requirements for fulfilling existing commitments provide a definite dampening effect on all new programs and this volume of committed expenditures must be taken into account when considering increases in future water resource expenditures.

RECOMMENDATIONS

- 16-1. Since continued heavy reliance must be placed on debt financing of water resources projects of all types at the State and local levels, unrealistic legal barriers to efficient debt acquisition and management should be removed in State and local constitutions, statutes, ordinances, and charters. These restrictions include debt and interest rate limitations that place local governments at a long-run cost and interest-rate disadvantage, and that ignore the fact that the bond markets themselves will reflect debt repayment capacity of local and State governments.
- 16-2. In selling bonds to finance water resources projects, representatives of State and local governments should give increased attention to those factors and circumstances that will facilitate effective debt repayment, such as refunding provisions, implementation of user charges, and pooling of risks within the umbrella of larger more stable government jurisdictions.
- 16-3. The increasing need for debt financing of water resource development by State and local governments, resulting from implementation of the Commission's recommendations on Federal cost-sharing policies, should not be impeded by repeal of the Federal tax exemption on State and local bond interest unless alternative provisions are made to assist these governments with increased interest cost burdens.

CHAPTER 17. BASIC DATA AND RESEARCH FOR FUTURE PROGRESS

CONCLUSIONS ON BASIC DATA

1. The adequacy of basic data to support evaluation, planning, and decisionmaking in water resources varies considerably. It is strongest with

respect to the quantitative aspects. The areas of greatest need are in the water quality, environmental, socioeconomic, and water-use aspects, including improvement in the program of reporting flood damages.

2. While great amounts of data are available, many potential data users do not know what data are available and where to go to get data. With the view to making better and more widespread use of available data, a well publicized referral system is needed.
3. There is a continuing need to identify gaps in the present data base as they become apparent through planning and evaluation studies and through a periodic assessment of the data program. One means of accomplishing this would be for planning and project study reports to regularly report data deficiencies. Such a regular reporting of data deficiencies should also be part of the Section 102 statements filed under NEPA.
4. Since planning and operational decisions are only as sound as the data base on which they rest, standards for gaging the accuracy of different types of data or the same kinds of data from different sources should be developed.
5. While data collection activities supportive of action programs or of a broad nature, such as the USGS gaging network and the Census, are continually reviewed for relevance, what is needed additionally is a focus on probable future data needs. This need is particularly apparent with respect to environmental data.
6. The water agencies should cooperate more extensively with general data collection and statistical agencies, such as the Census Bureau, to encourage collection of data useful for water resources planning and management. This may require transfers of funds.
7. The thrust of most past data collection activities has centered on the provision of raw statistics or elementary statistical relationships. While this is important and should be continued, future work should also focus on data which provide a general view of an entire system, and on data systems designed to provide information on routine cause and effect relationships.
8. A regularized process of before-and-after-implementation studies of water development projects would yield very valuable information.
9. It would be advantageous to combine the water data collection activities of the National Oceanic and Atmospheric Administration and the U.S. Geological Survey under one administration.

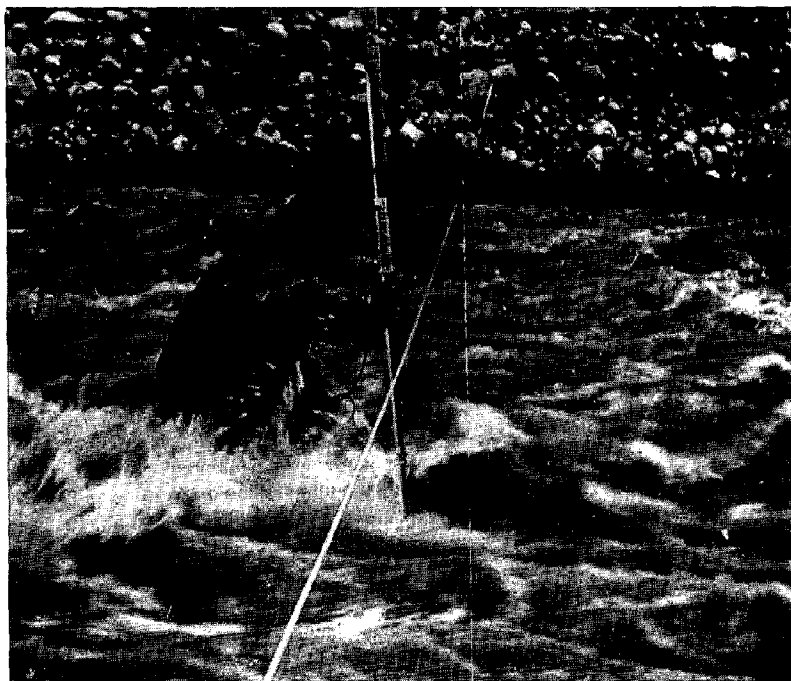
RECOMMENDATIONS

- 17-1. The reconstituted Water Resources Council should:
 - a. Establish a water resources data referral center and periodically publish an updated catalog of sources of water-related data.

- b. Identify gaps in the present water data base and identify the probable long-term basic data requirements which will be needed to support future planning and decisionmaking in water resources.
 - c. Work more extensively with nonwater agencies to make their data collection more useful to water resources planning and management.
- 17-2. All water resources planning reports and environmental impact statements should contain an assessment of the deficiencies in the factual base. Such reports should indicate which decisions or findings are most sensitive to data deficiencies.
 - 17-3. High priority should be given to research in developing methods for data synthesis and transfer.
 - 17-4. Studies before and after project implementation should be conducted to ascertain the adequacy of the basic data used in planning and decisionmaking as well as cause and effect relationships.
 - 17-5. Congress should enact legislation to merge the National Oceanic and Atmospheric Administration (with the exception of the fisheries and coastal zone management activities) and the U.S. Geological Survey into a single agency in the U.S. Department of the Interior.

CONCLUSIONS ON RESEARCH

- 1. The presently diversified water resource research effort (i.e., mission *High priority should be given to research in developing methods for making better use of available water data.*



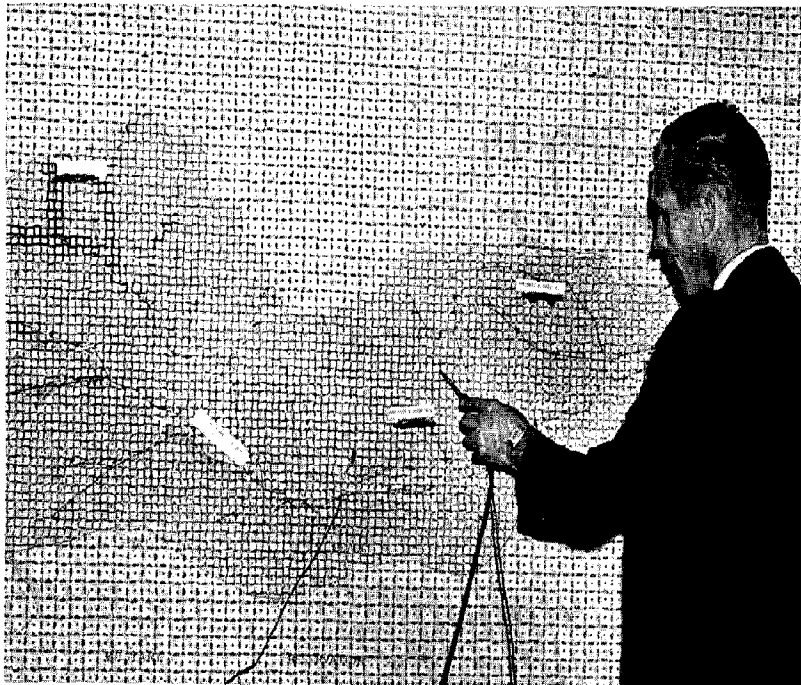
agency research and grant agency research) has generally served the Nation well.

2. To assure continued success, steps should be taken to develop a closer tie between planning and research in order to reinforce the value and relevance of each.
3. If the Nation is aggressively to explore the research and development of new technologies in water research and related fields, it is important that an agency or office charged with this mission be established.

RECOMMENDATIONS

- 17-6. The Water Resources Council should, through the exercise of authority granted to it under the Water Resources Planning Act:
 - a. Direct that water resources planning studies include an assessment of research needed to support planning objectives and a recommended research program to develop the scientific and technological base necessary to cope with future problems.
 - b. Review planning reports for needed research as part of the customary WRC review to aid the Council in preparing annually an assessment of needed research with specific priority recommendations to support the objectives of the Water Resources Planning Act.
 - c. Develop guidelines for field planning entities to assist in reflecting technological impacts in both short- and long-range

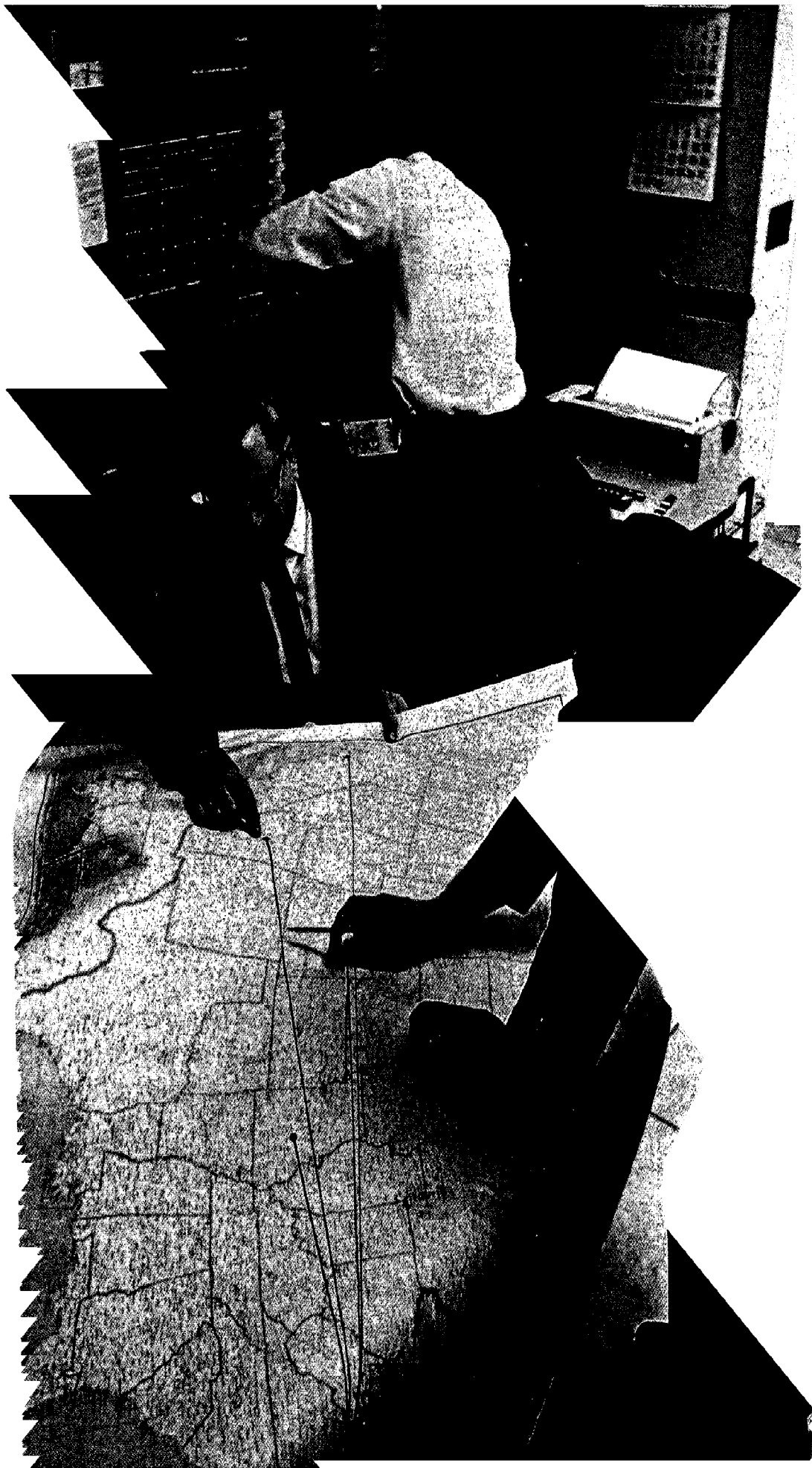
Closer ties between planning and research should be developed in order to enhance the value and relevance of each.



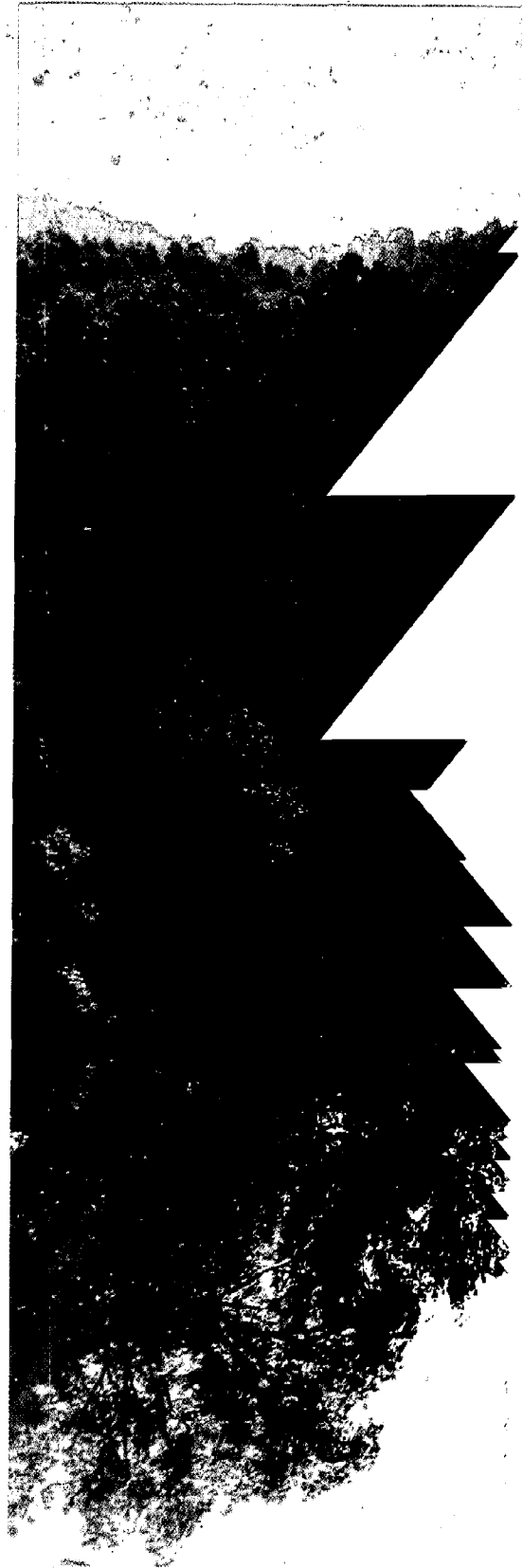
Major Federal water data programs of the Geological Survey and the National Oceanic and Atmospheric Administration should be merged.

water resources planning.

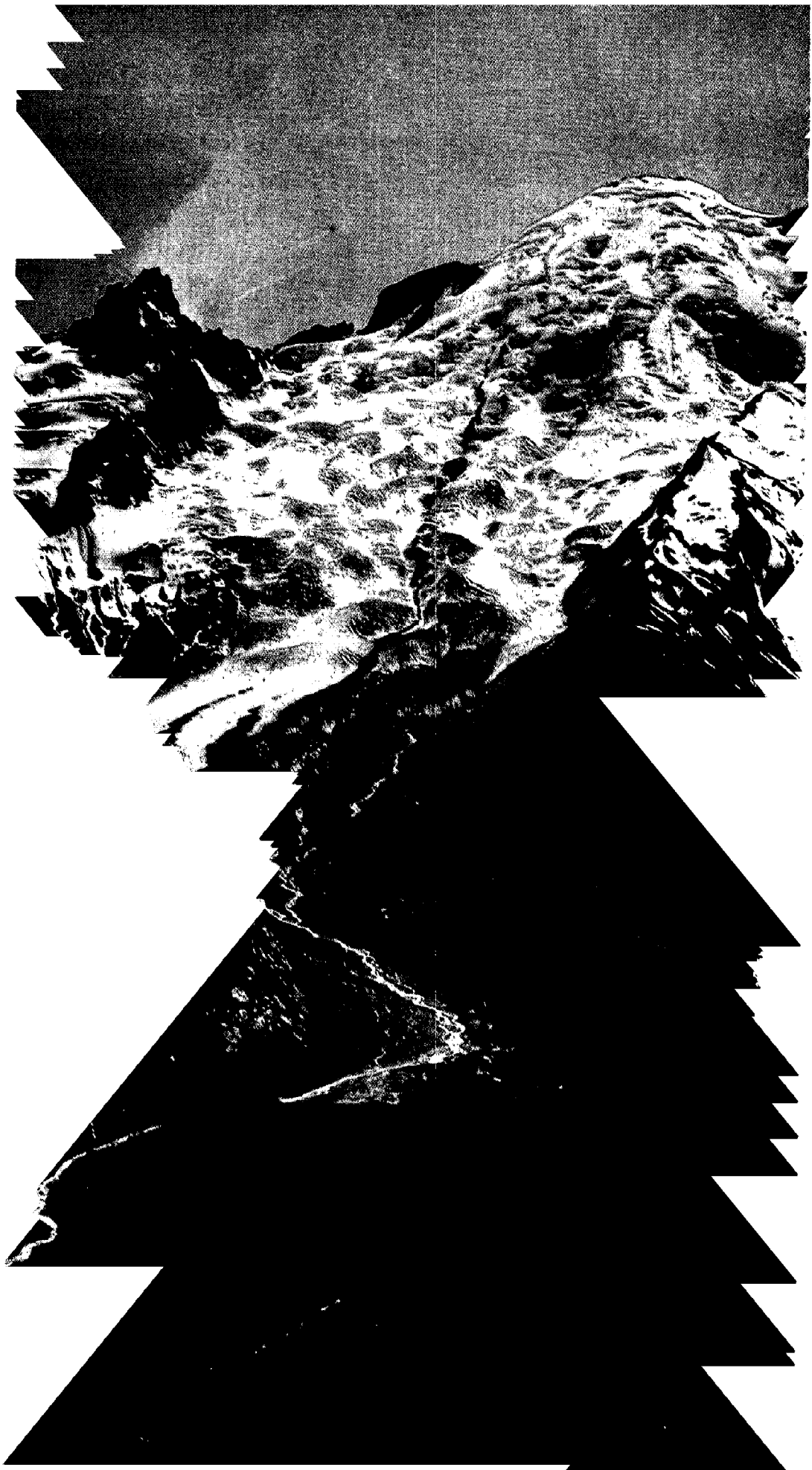
- 17-7. The research program of the Office of Saline Water, the weather modification activities of the National Oceanic and Atmospheric Administration, the weather modification and geothermal resources program of the Bureau of Reclamation, and research on wastewater reuse technology of the Environmental Protection Agency should be transferred to a new Office of Water Technology in the Department of the Interior. Additionally, this new office should absorb the functions of the Office of Water Resources Research and should maintain an up-to-date state-of-the-art assessment of new technologies to assist planners and decisionmakers in the development and evaluation of water management alternatives.
- 17-8. The Committee on Water Resources Research which has functioned as an arm of the Federal Council for Science and Technology should be reconstituted as a committee of the Water Resources Council.



APPENDICES









Appendix I
Public Law 90-515
90th Congress, S. 20
September 26, 1968

An Act

82 STAT. 868

To provide for a comprehensive review of national water resource problems and programs, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "National Water Commission Act".

National Water
Commission Act.

THE NATIONAL WATER COMMISSION

SEC. 2. (a) There is established the National Water Commission (hereinafter referred to as the "Commission").

(b) The Commission shall be composed of seven members who shall be appointed by the President and serve at his pleasure. No member of the Commission shall, during his period of service on the Commission, hold any other position as an officer or employee of the United States, except as a retired officer or retired civilian employee of the United States.

Membership.

(c) The President shall designate a Chairman of the Commission (hereinafter referred to as the "Chairman") from among its members.

(d) Members of the Commission may each be compensated at the rate of \$100 for each day such member is engaged in the actual performance of duties vested in the Commission. Each member shall be reimbursed for travel expenses, including per diem in lieu of subsistence, as authorized by 5 U.S.C., sec. 5703, for persons in the Government service employed intermittently.

Compensation.

Travel pay.

80 Stat. 499.

(e) The Commission shall have an Executive Director, who shall be appointed by the Chairman with the approval of the Commission and shall be compensated at the rate determined by the U.S. Civil Service Commissioners. The Executive Director shall have such duties and responsibilities as the Chairman may assign.

Executive
Director.

DUTIES OF THE COMMISSION

SEC. 3. (a) The Commission shall (1) review present and anticipated national water resource problems, making such projections of water requirements as may be necessary and identifying alternative ways of meeting these requirements—giving consideration, among other things, to conservation and more efficient use of existing supplies, increased usability by reduction of pollution, innovations to encourage the highest economic use of water, interbasin transfers, and technological advances including, but not limited to, desalting, weather modification, and waste water purification and reuse; (2) consider economic and social consequences of water resource development, including, for example, the impact of water resource development on regional economic growth, on institutional arrangements, and on esthetic values affecting the quality of life of the American people; and (3) advise on such specific water resource matters as may be referred to it by the President and the Water Resources Council.

(b) The Commission shall consult with the Water Resources Council regarding its studies and shall furnish its proposed reports and recommendations to the Council for review and comment. The Commission shall submit simultaneously to the President and to the United States Congress such interim and final reports as it deems appropriate, and the Council shall submit simultaneously to the President and to the United States Congress its views on the Commission's reports. The President shall transmit the Commission's final report to the Congress

Reports to
President and
Congress.

82 STAT. 869

Termination
date.

together with such comments and recommendations for legislation as he deems appropriate.

(c) The Commission shall terminate not later than five years from the effective date of this Act.

POWERS OF THE COMMISSION

80 Stat. 443,
5 USC 5101-
5115,
80 Stat. 416.

79 Stat. 246,
42 USC 1962b-
1962b-6.

SEC. 4. (a) The Commission may (1) hold such hearings, sit and act at such times and places, take such testimony, and receive such evidence as it may deem advisable; (2) acquire, furnish, and equip such office space as is necessary; (3) use the United States mails in the same manner and upon the same conditions as other departments and agencies of the United States; (4) without regard to the civil service laws and regulations and without regard to 5 U.S.C., ch. 51, employ and fix the compensation of such personnel as may be necessary to carry out the functions of the Commission; (5) procure services as authorized by 5 U.S.C., sec. 3109, at rates not to exceed \$100 per diem for individuals; (6) purchase, hire, operate, and maintain passenger motor vehicles; (7) enter into contracts or agreements for studies and surveys with public and private organizations and transfer funds to Federal agencies and river basin commissions created pursuant to title II of the Water Resources Planning Act to carry out such aspects of the Commission's functions as the Commission determines can best be carried out in that manner; and (8) incur such necessary expenses and exercise such other powers as are consistent with and reasonably required to perform its functions under this title.

(b) Any member of the Commission is authorized to administer oaths when it is determined by a majority of the Commission that testimony shall be taken or evidence received under oath.

POWERS AND DUTIES OF THE CHAIRMAN

SEC. 5. (a) Subject to general policies adopted by the Commission, the Chairman shall be the chief executive of the Commission and shall exercise its executive and administrative powers as set forth in section 4(a) (2) through section 4(a) (8).

(b) The Chairman may make such provision as he shall deem appropriate authorizing the performance of any of his executive and administrative functions by the Executive Director or other personnel of the Commission.

OTHER FEDERAL AGENCIES

SEC. 6. (a) The Commission may, to the extent practicable, utilize the services of the Federal water resource agencies.

(b) Upon request of the Commission, the head of any Federal department or agency or river basin commission created pursuant to title II of the Water Resources Planning Act is authorized (1) to furnish to the Commission, to the extent permitted by law and within the limits of available funds, including funds transferred for that purpose pursuant to section 4(a) (7) of this Act, such information as may be necessary for carrying out its functions and as may be available to or procurable by such department or agency, and (2) to detail to temporary duty with this Commission on a reimbursable basis such personnel within his administrative jurisdiction as it may need or believe to be useful for carrying out its functions, each such detail to be without loss of seniority, pay, or other employee status.

Financial and
administrative
services by
GSA.

(c) Financial and administrative services (including those related to budgeting, accounting, financial reporting, personnel, and procurement) shall be provided the Commission by the General Services Administration, for which payment shall be made in advance, or by

September 26, 1968

- 3 -

Pub. Law 90-515

82 STAT. 370

reimbursement from funds of the Commission in such amounts as may be agreed upon by the Chairman of the Commission and the Administrator of General Services: *Provided*, That the regulations of the General Services Administration for the collection of indebtedness of personnel resulting from erroneous payments (5 U.S.C., sec. 5514) shall apply to the collection of erroneous payments made to or on behalf of a Commission employee, and regulations of said Administrator for the administrative control of funds (31 U.S.C. 665(g)) shall apply to appropriations of the Commission: *And provided further*, That the Commission shall not be required to prescribe such regulations. 80 Stat. 477.

APPROPRIATIONS

SEC. 7. There are hereby authorized to be appropriated not to exceed \$5,000,000 to carry out the purposes of this Act.

Approved September 26, 1968.

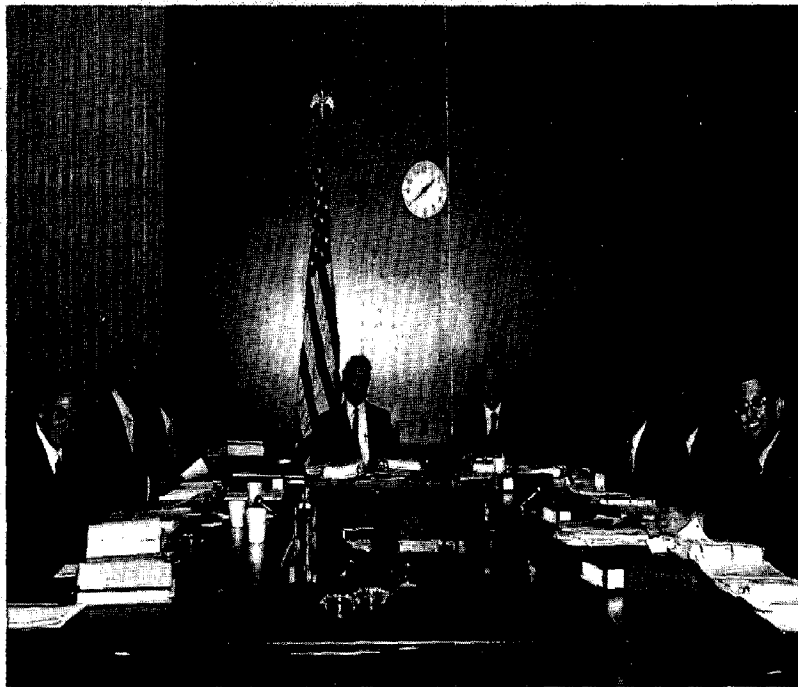
LEGISLATIVE HISTORY:

HOUSE REPORTS: No. 376 (Comm. on Interior & Insular Affairs) and No. 1862 (Comm. of Conference).

SENATE REPORT No. 25 (Comm. on Interior & Insular Affairs).

CONGRESSIONAL RECORD:

Vol. 113 (1967): Feb. 6, considered and passed Senate.
July 12, considered and passed House, amended.
Vol. 114 (1968): Sept. 5, House agreed to conference report,
Sept. 12, Senate agreed to conference report.



The Commission pauses for a photo. Left to right, James E. Murphy, Howell Appling, Jr., Roger C. Ernst, Theodore M. Schad, Charles F. Luce, James R. Ellis, Ray K. Linsley, Josiah Wheat.

Appendix II

THE COMMISSION

Charles F. Luce, Chairman

Chairman of the Board of Trustees and Chief Executive Officer, Consolidated Edison Company of New York, Inc., since 1967. Native of Platteville, Wisconsin. Graduate of the University of Wisconsin; Law clerk to Mr. Justice Hugo L. Black for the Supreme Court term of 1943-44. Private practice of law for 15 years in Walla Walla, Washington, serving as general counsel for the Confederated Tribes of the Umatilla Indian Reservation, Pendleton, Oregon. Appointed Bonneville Power Administrator in 1961. Under Secretary of the Interior in the Johnson Administration, 1966-67. Member, Board of Trustees of Columbia University in the City of New York; and of the Boards of Metropolitan Life Insurance Company, UAL, Inc., and United Airlines, Inc. Mr. Luce was appointed to the National Water Commission on October 9, 1968.

Howell Appling, Jr.

Founder and President, Independent Distributors, a wholesale farm equipment distribution firm in Portland, Oregon. An engineering graduate of Rice University; former Oregon Secretary of State under Governor Hatfield; Director and former President, National Farm Equipment Wholesaler's Association; consultant to Oregon State University Agricultural Experiment Stations; former water treatment engineer, Consolidated Chemical Industries, Inc., of Houston, Texas, and Baton Rouge, La. Mr. Appling was appointed to the Commission April 9, 1969.

James R. Ellis

Attorney and partner in the law firm of Preston, Thorgrimson, Ellis, Holman and Fletcher, Seattle, Washington; Member, Board of Regents, University of Washington, 1965 to date, President 1971-72; Trustee, The Ford Foundation, 1970 to date; President, Forward Thrust, Inc., 1966 to date; President, Municipal League of Seattle and King County, 1962-64. Mr. Ellis was appointed to the National Water Commission on October 30, 1970.

Roger C. Ernst

Consultant, Arizona Public Service Company, and President, Central Arizona Water Conservation District. He also is a member of the Arizona State Water Quality Control Council and the Arizona Water Resources Council, and President of the Association on American Indian Affairs. Mr. Ernst was formerly an Assistant Secretary of the Interior during the Eisenhower Administration. He is a native of Colorado. Mr. Ernst was appointed to the National Water Commission on November 21, 1969.

Ray K. Linsley

Professor of Hydraulic Engineering, Stanford University. Also served as Executive Head, Department of Civil Engineering, Associate Dean, and Director of Program in Engineering-Economic Planning. Before joining the University, Mr. Linsley worked with the Tennessee Valley Authority and the U.S. Weather Bureau, and served for a year as Staff Assistant, Office of Science and Technology, in the Executive Office of the President. He is a Registered Professional Engineer in California and Connecticut. Mr. Linsley has been a member of the National Water Commission since October 9, 1968.

James E. Murphy

Attorney and member of the law firm of Murphy, Robinson, Heckathorn and Phillips, Kalispell, Montana. Native of Laredo, Missouri; Member of the Missouri House of Representatives, 1939-41. Wheat rancher and a Director of the Conrad National Bank of Kalispell, Montana. Member of the Columbia Interstate Compact Commission. Montana representative on the Pacific Northwest River Basins Commission from 1966 to 1969. Member of the Montana House of Representatives, 1967-73. Mr. Murphy was appointed to the National Water Commission on October 30, 1970.

Josiah Wheat

Partner in the law firm of Wheat, Wheat and Stafford of Woodville, Texas; Legal Counsel, Texas Water Quality Board; Assistant General Counsel, Lower Neches Valley Authority; formerly Chairman of the Board and twice President, Texas Water Conservation Association; Past President, State Bar of Texas; Member, House of Delegates, American Bar Association; Fellow, American Bar Foundation; Member, Executive Committee, State Bar of Texas Section on Environmental Law; Member, American Bar Association Special Committee on Environmental Law. Mr. Wheat was appointed to the National Water Commission on November 21, 1969.

Appendix III

PROFESSIONAL STAFF*

Theodore M. Schad	Executive Director
Howard L. Cook	Deputy Director
Ralph E. Fuhrman	Assistant Director-Programs
Robert N. Baker	Assistant Director-Administration
Florence Broussard	Assistant to the Director
Myron B. Katz	Editor-in-Chief

Legal Division

Philip M. Glick, Legal Counsel
Charles J. Meyers
Ernst Liebman
John L. DeWeerd
Richard L. Dewsnup
Gary L. Greer
William A. Hillhouse II

Engineering and Environmental Sciences Division

Victor A. Koelzer, Chief
Edwin B. Haycock
Alexander Bigler
Kenneth L. Bowden
John S. Gladwell
Jack D. Lackner
Thomas Scott
Richard Tucker
Robert E. Vincent

Social and Behavioral Sciences Division

Lyle E. Craine, Chief
(June 1969 – August 1970)
Dean E. Mann, Chief
(September 1970 – October 1971)
Gary Taylor
Harry R. Seymour
Frank Bollman
Helen Ingram
Ray M. Johns
Truman P. Price
John H. Stierna
Henry Vaux, Jr.
Ann S. Wilm

Forecast Division

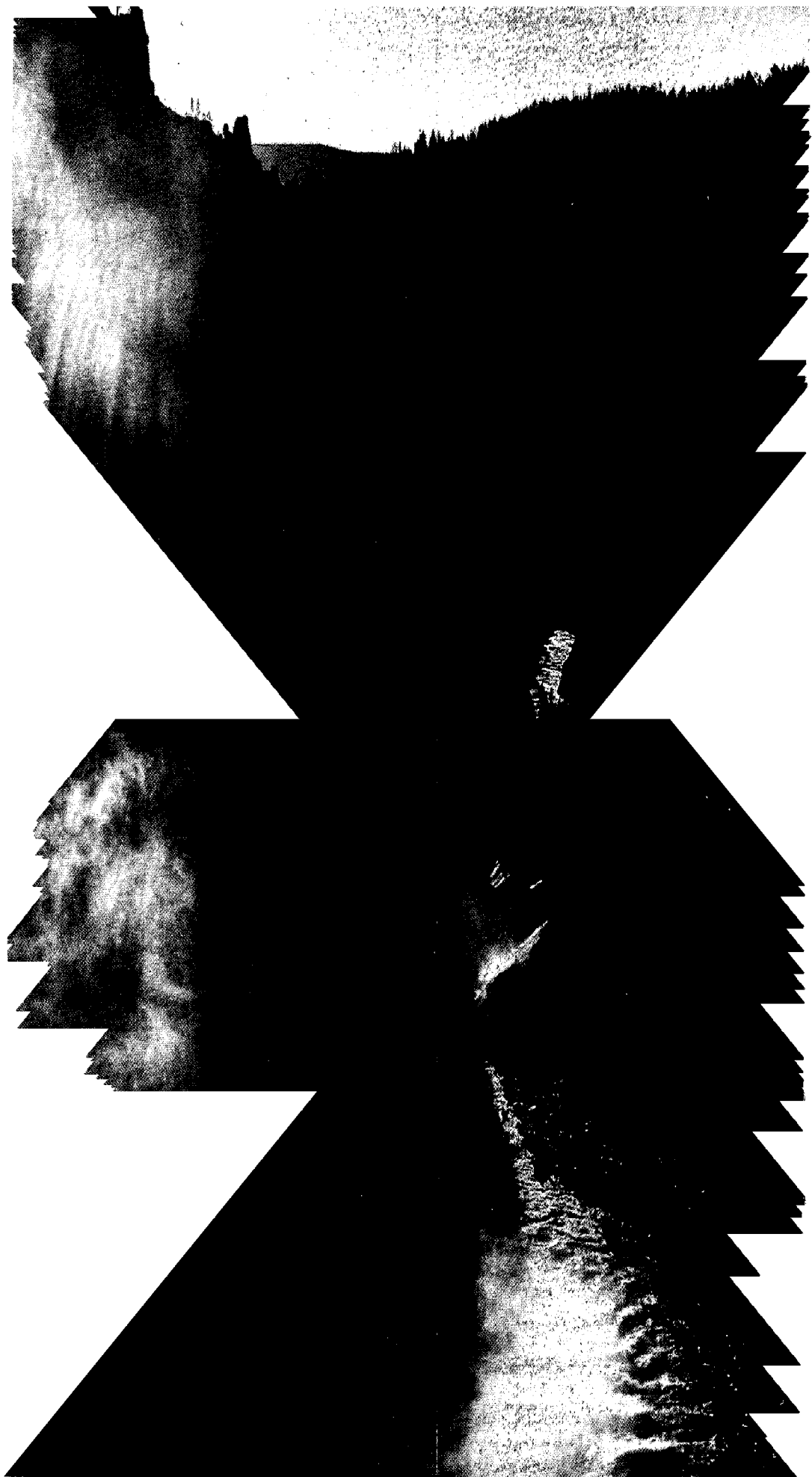
Russell G. Thompson
M. Leon Hyatt

PRINCIPAL CONSULTANTS

Edward A. Ackerman**	Abel Wolman	Ralph W. Johnson
Harvey O. Banks		Gilbert F. White
Irving K. Fox		Edward Weinberg
Maynard M. Hufschmidt		Nathaniel Wollman

*Members of the staff who served for a year or more.

**Deceased.



Appendix IV

BACKGROUND REPORTS

Reports Available Through the National Technical Information
Service, 5285 Port Royal Road, Springfield, Va. 22151,
with Accession Number and Price

Looking Ahead

FUTURE WATER DEMANDS, Resources for the Future, PB 197 877,
\$3.00

POTENTIAL TECHNOLOGICAL ADVANCES AND THEIR IMPACT ON
ANTICIPATED WATER REQUIREMENTS, National Academy of
Sciences, PB 204 053, \$3.00

FORECASTING WATER DEMANDS, Thompson et al, PB 206 491, \$6.00

AGRICULTURAL WATER DEMANDS, Iowa State, PB 206 790, \$6.00

ALTERNATIVE DEMANDS FOR WATER AND LAND FOR AGRI-
CULTURAL PURPOSES, Iowa State, PB 211 444, \$4.85

Environmental Reports

ENVIRONMENTAL QUALITY AND WATER DEVELOPMENT, Volume
I, Goldman, PB 207 113, \$6.00

ENVIRONMENTAL QUALITY AND WATER DEVELOPMENT, Volume
II, Goldman, PB 207 114, \$6.00

AN AESTHETIC OVERVIEW OF THE ROLE OF WATER IN THE
LANDSCAPE, University of California, PB 207 315, \$6.00

CLASSIFYING WATER BODIES, Colorado State, PB 208 667, \$5.45

RECYCLING AND ECOSYSTEM RESPONSE, Michigan State,
PB 208 669, \$5.45

LEGAL DEVICES FOR ACCOMMODATING WATER RESOURCES
DEVELOPMENT AND ENVIRONMENTAL VALUES, Hillhouse and
DeWeerd, PB 208 835, \$13.50

PRESERVING THE GREAT LAKES, Kelnhofer, PB 211 442, \$4.85

WATER USE AND MANAGEMENT ASPECTS OF STEAM ELECTRIC
POWER GENERATION, Waste Heat Panel, PB 210 355, \$4.85

Water Pollution Control

PUBLIC REGULATION OF WATER QUALITY IN THE UNITED
STATES, Hines, PB 208 309, \$12.50

WATER POLLUTION CONTROL IN THE UNITED STATES, Water
Pollution Control Panel, PB 212 139, \$6.75

WASTEWATER MANAGEMENT PROJECT, MUSKEGON COUNTY,
MICHIGAN, Center for Urban Studies, PB 208 310, \$6.00

Economics of Water Development

- REGIONAL ECONOMIC DEVELOPMENT – THE ROLE OF WATER,
Utah State, PB 206 372, \$9.00
POPULATION GROWTH IN COMMUNITIES IN RELATION TO WATER
RESOURCES POLICY, Rivkin/Carson, Inc., PB 205 248, \$3.00
PRICING AND EFFICIENCY IN WATER RESOURCE MANAGEMENT,
George Washington University, PB 209 083, \$6.75
ECONOMIC VALUE OF WATER: CONCEPTS AND EMPIRICAL ESTI-
MATES, Colorado State, PB 210 356, \$9.00
ECONOMIC VALUE OF WATER IN A SYSTEMS CONTEXT, Butcher et
al, PB 210 357, \$6.00

Analyses of Policies

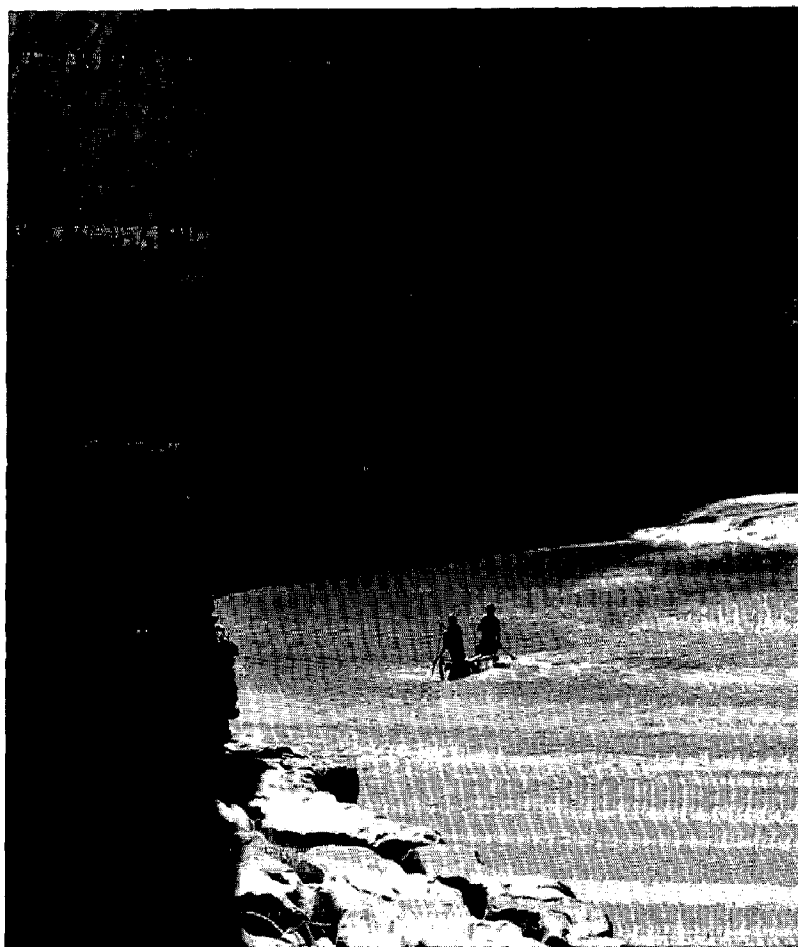
- AUTHORIZATION OF FEDERAL WATER PROJECTS, Ely,
PB 206 096, \$6.75
AUTHORIZATION AND APPROPRIATION PROCESSES FOR WATER
RESOURCE DEVELOPMENT, Cornell, PB 212 140, \$6.75
FEDERAL COST-SHARING POLICIES FOR WATER RESOURCES,
National Bureau of Standards, PB 208 304, \$6.75
FEDERAL DECISIONMAKING FOR WATER RESOURCE DEVELOP-
MENT, Schmid, PB 211 441, \$5.45
WATER RESOURCE POLICY IN WISCONSIN, University of Wisconsin,
PB 204 928, \$3.00

Analyses of Programs

- INLAND WATERWAY TRANSPORT POLICY IN THE UNITED
STATES, Blood, PB 208 668, \$6.75
ACREAGE LIMITATION IN THE FEDERAL RECLAMATION PRO-
GRAM, Hogan, PB 211 840, \$9.00
ALTERNATIVE ADJUSTMENTS TO NATURAL HAZARDS, University
of Pittsburgh, PB 211 922, \$5.45
HYDROELECTRIC POWER POLICY, Price, PB 204 052, \$3.00
RESEARCH AND DEVELOPMENT IN WATER RESOURCES, Gladwell,
PB 210 823, \$6.75

Preparation of Water Plans

- WATER RESOURCE PLANNING, Water Resources Panel, PB 211 921,
\$6.75
SYSTEMS ANALYSIS IN WATER RESOURCES PLANNING, Meta
Systems, Inc., PB 204 374, \$6.00
PUBLIC PARTICIPATION IN WATER RESOURCES PLANNING,
Warner, PB 204 245, \$3.00



Institutional Arrangements

- INTERSTATE WATER COMPACTS, Muys, PB 202 998, \$6.00
THE FEDERAL-STATE REGIONAL CORPORATION, Solomon,
PB 202 997, \$3.00
INSTITUTIONS FOR WATER PLANNING, Hart, PB 204 244, \$3.00
THE NEW ENGLAND RIVER BASINS COMMISSION - A CASE
STUDY, Ingram, PB 204 375, \$3.00
INSTITUTIONAL ARRANGEMENTS FOR WATER RESOURCE DE-
VELOPMENT, Ostrom, PB 207 314, \$9.00
THE WATER RESOURCES COUNCIL, Liebman, PB 211 443, \$6.75
INTERGOVERNMENTAL RELATIONS IN WATER RESOURCES AC-
TIVITIES, Wendell and Schwan, PB 210 358, \$12.50
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COURTS AND WATER, Thompson, PB 211 974, \$6.00

Special Studies in Water Law

FUNCTIONAL ANALYSIS OF APPROPRIATION LAW, Meyers,
PB 202 617, \$3.00
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PB 202 620, \$3.00
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PB 205 249, \$3.00
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PB 202 618, \$3.00
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PB 205 003, \$3.00
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FEDERAL-STATE RELATIONS IN THE LAW OF WATER RIGHTS,
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RIPARIAN WATER LAW – A FUNCTIONAL ANALYSIS, Davis,
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GROUND WATER LAW, MANAGEMENT AND ADMINISTRATION,
Corker, PB 205 527, \$6.00

Means of Increasing Water Supplies

EXTENDING THE UTILITY OF NON-URBAN WATER SUPPLIES, Utah
State University, PB 207 115, \$3.00
LAW OF INTERBASIN TRANSFERS, Johnson, PB 202 619, \$3.00
INTERBASIN WATER TRANSFERS – A POLITICAL AND INSTITU-
TIONAL ANALYSIS, Mann, PB 208 303, \$6.00
DESALTING, Koelzer, PB 209 942, \$5.45
PRECIPITATION MODIFICATION, Lackner, PB 201 534, \$3.00
WASTEWATER REUSE, Gavis, PB 201 535, \$3.00
WATERSHED MANAGEMENT, Sopper, PB 206 370, \$6.00
GROUND WATER MANAGEMENT, Mack, PB 201 536, \$3.00

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the United States Government Printing Office, Washington, D.C. 20402.

A SUMMARY-DIGEST OF THE FEDERAL WATER LAWS AND PRO-
GRAMS, John L. DeWeerd and Philip M. Glick, editors, \$1.75 domestic
postpaid, \$1.50 at bookstore.

A SUMMARY-DIGEST OF STATE WATER LAWS, Richard L. Dewsnap and
Dallin W. Jensen, editors, and Robert W. Swenson, associate editor, \$4.55
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